VisionXtreme Pte. Ltd.

ICubeC User's Manual

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1 Introduction

The ICubeC programmable illumination controller allows users to set different intensities and patterns to highlight defects on various types of objects. With ability to switch light intensity and patterns at high speed, multiple images of the same device can be captured under different light conditions, to highlight a variety of defects. On board flash memory enables multiple parameter files to be stored for easy retrieval in the event of power loss.

1.1 Performance and Specification

Category	*Specification*
Power Requirements	+24VDC @5A max (32-Segments)
Current Consumption	220 mA (Max) per segment
Host Interface	USB1.1 or USB 2.0
Strobe Pulse Time	Programmable via API (Configurable from 1 to 10 msec)
External Trigger	2 (Software Programmable Segments)
Onboard Flash Memory	8K bytes (Max)
Camera Trigger Delay	Programmable in 3 steps
Dimension	115 mm (L) x 105 mm (W) X 34 mm (H)
Weight	380 GMS

Table 1.1: Performance Specifications of ICubeC

1.2 Mechanical Specifications

1.2.1 ICubeC Dimensions

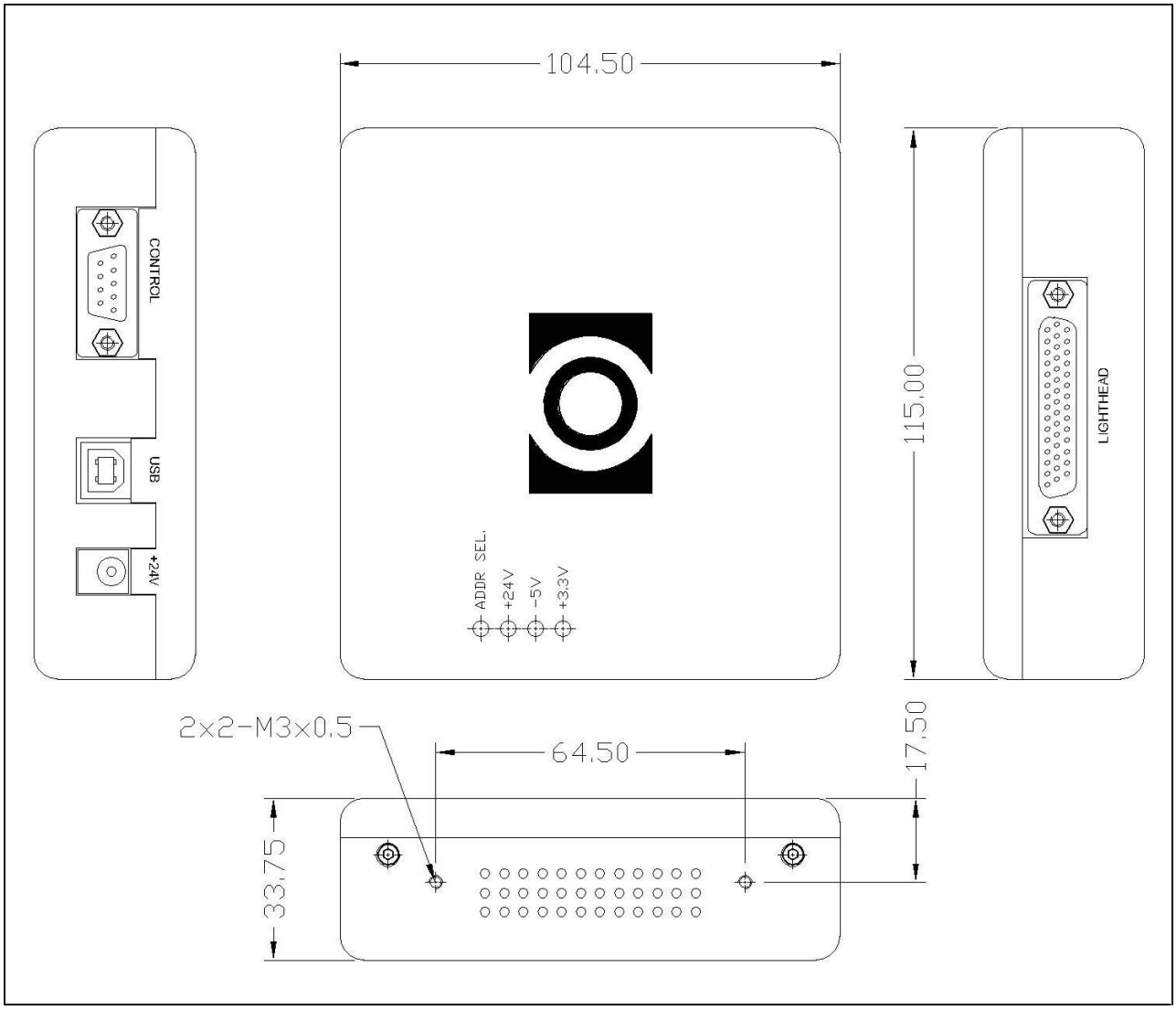


Figure 1.1: ICubeC Mechanical Dimension

1.3 Environmental Requirements

1.3.1 Temperature and Humidity

Housing temperature during operation:	0° C … + 50° C (+ 32° F … +122° F)
Storage temperature:	- 20° C … + 80° C (-4° F … +176° F)
Humidity during operation:	20% … 80% relative, without condensation
Storage humidity:	20% … 80% relative, without condensation

1.3.2 Ventilation

The ICubeC housing is provided with Ventilation Fan so as to maintain the temperature below 40ºC during operation. Proper Heat Sinks are to be provided.

1.4 Precautions

Read the ICubeC user's manual carefully before using the product

1.4.1 Input Power

Reversing of the polarity of the input power to the ICubeC connector will damage it.

1.4.2 Transportation

Transportation of the product should be done in the same packaging.

1.4.3 Warranty precautions

- ***Opening the casing***

  Do not open the casing. If the product is disassembled, reworked or repaired by other than recommended service person, we will not take the responsibility of any subsequent malfunctioning of the product.

- ***Keep out of foreign matters***

  Be careful not to allow liquid, flammable, or metallic material inside the housing. If operated with any foreign matter inside, the ICubeC may fail or malfunction

2 ICubeC Physical Interface

This section provides the detailed information on connector pin-out, physical interface and voltage requirements for ICubeC.

2.1 General Description

ICubeC is interfaced to PC via the USB port and to camera via 15-pin D-Sub connector. It connects to the 32 Segment Light via 44-pin connector.

2.2 Connector Details

There are totally four connectors in ICubeC.

- USB interface Connector for Control Signals
- 15-pin D-Sub Connector [Female, Right angle] for Strobe/Trigger Signal
- DC Power socket for power supply
- 44-pin connector [3-row, Female, Right angle] for Light Head Connection

The different connector views are shown in the below figures

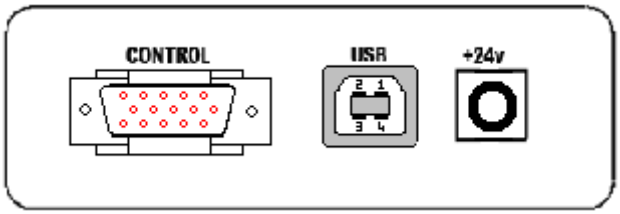


Fig 2.1: Front view of ICubeC

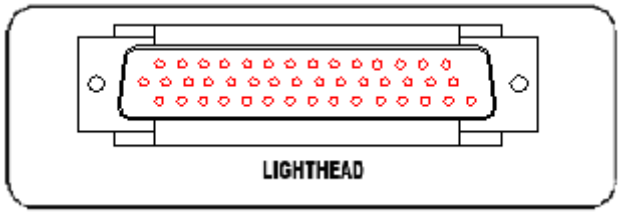
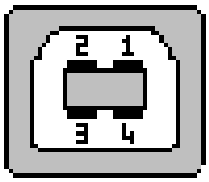


Fig 2.2: 44-pin connector Rear view of ICubeC

2.3 Pin Assignments

2.3.1 USB Interface connector

The USB Interface Connector is used for communicating ICubeC with PC to provide control signals and data to the ICubeC from PC. The Pin numbering is shown in the below diagram. Corresponding Pin assignment is shown in Table 2.1

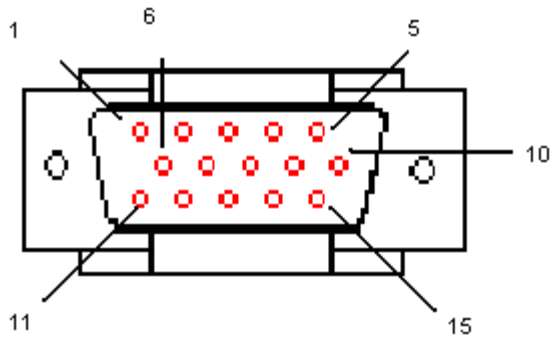


USB Connector	*Signal Description*
1	+5 VDC
2	Data -
3	Data +
4	GND

Table 2.1: Pin-out of USB Connector

2.3.2 15-pin D-Sub Connector

This connector is used for interfacing the trigger and strobe signal from/to camera according to requirement. Following is the pin-out for the 15-pin control connector. The Pin numbering is shown in the below diagram. Corresponding Pin assignment is shown in table 2.2



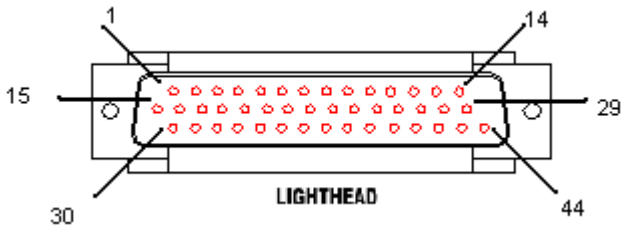
15-pin Connector Pin	*Signal Description*
1	Trigger 1
2	Trigger 3
3	Camera Strobe 1
4	Camera Strobe 3
5	Reserved
6	GND
7	GND
8	GND
9	Trigger 2

10	Trigger 4
11	Camera Strobe 2
12	Camera Strobe 4
13	Reserved
14	GND
15	GND

Table 2.2: Pin-out of Control Connector

2.3.3 44-pin D-Sub connector

The 44-Pin connector of ICubeC is used to provide the light intensity output from ICubeC to the 32-segment Lighthead. The Pin numbering is shown in the below diagram. Corresponding Pin assignments for the 44-pin connector are shown in Table 2.3



44-pin Connector Pin	*Signal Description*
1	+24V
2	Output 1
3	Output 2
4	Output 3
5	Output 4
6	Output 5
7	Output 6
8	Output 7
9	Output 8
10	+24V
11	Output 9
12	Output 10
13	Output 11
14	Output 12

15	Output 13
16	Output 14
17	Output 15
18	Output 16
19	Output 17
20	Output 18
21	Output 19
22	Output 20
23	Output 21
24	Output 22
25	Output 23
26	Output 24
27	Output 25
28	Output 26
29	Output 27
30	Output 28
31	Output 29
32	Output 30
33	Output 31
34	Output 32
35-44	NA

Table 2.3: Pin-out of Lighthead connector.

2.3.4 Power Supply Connector

The power requirement of ICubeC is +24VDC 5.3A. The Pin numbering is shown in the below diagram.

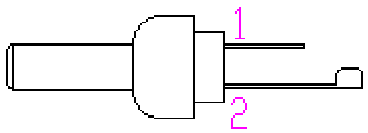


Table 2.4 shows the pin assignments of the DC power supply connector.

DC Power Connector	Signal Description
1	+24VDC
2	GND

Table 2.4: Pin-out of DC Power Connector

2.4 Cable Drawings

2.4.1 Power Supply Cable

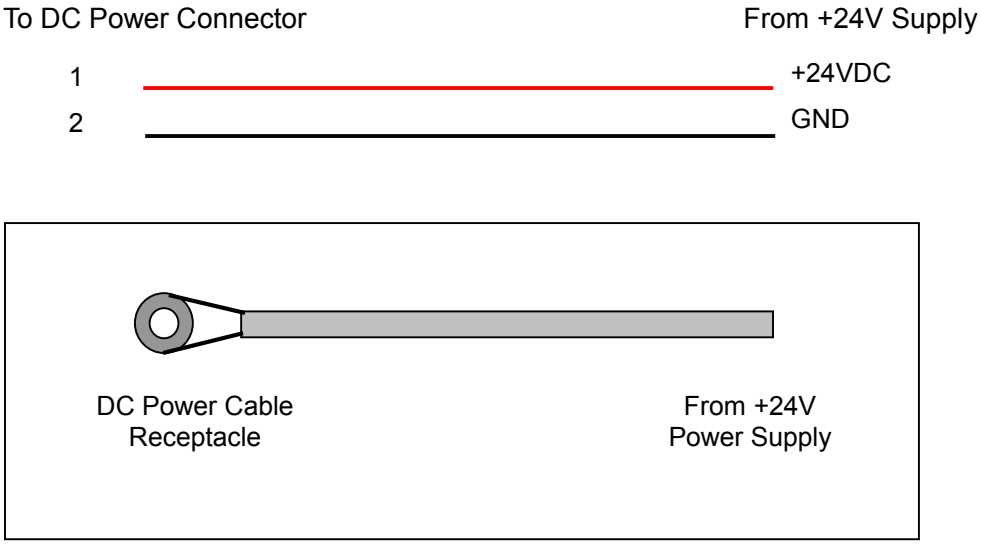


Fig 2.3: Power Supply Cable

2.4.2 USB Cable

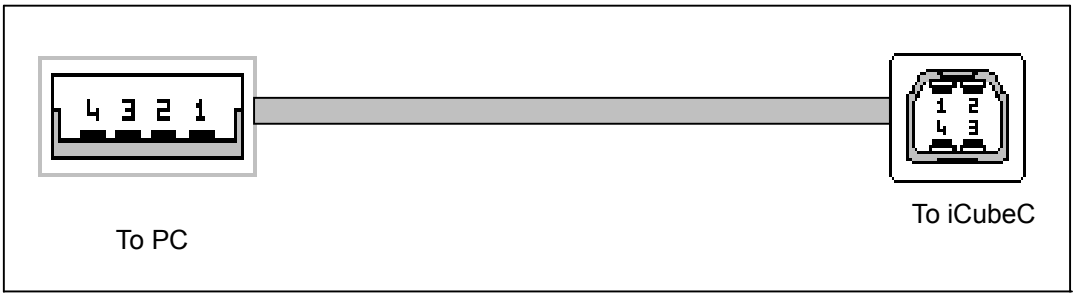
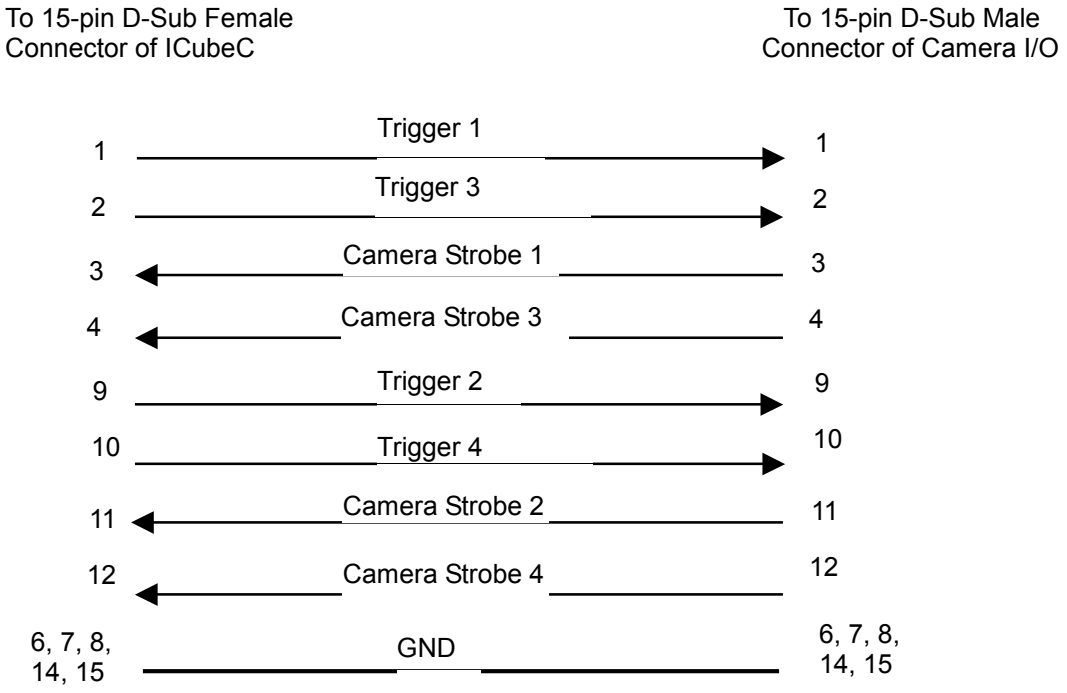


Fig 2.4: USB Cable

2.4.3 Control Cable



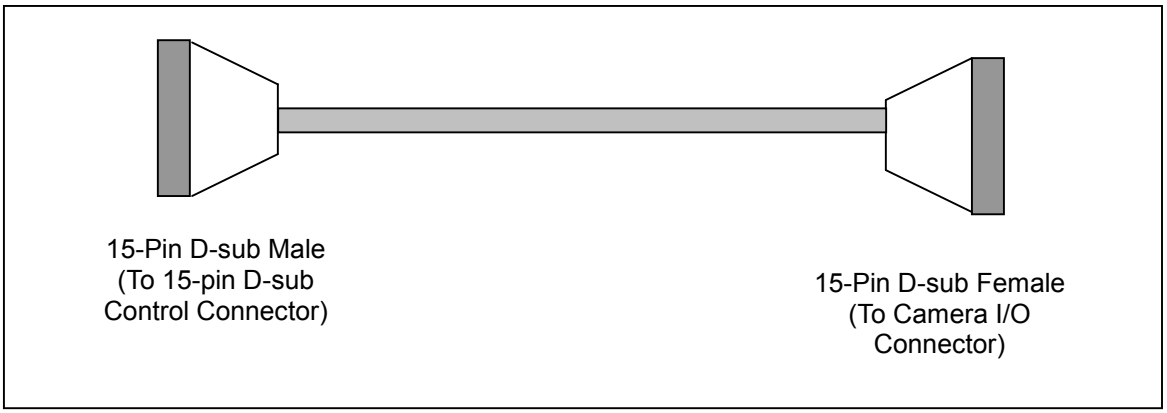


Fig 2.5: Control Cable

2.4.4 Lighthead Interface

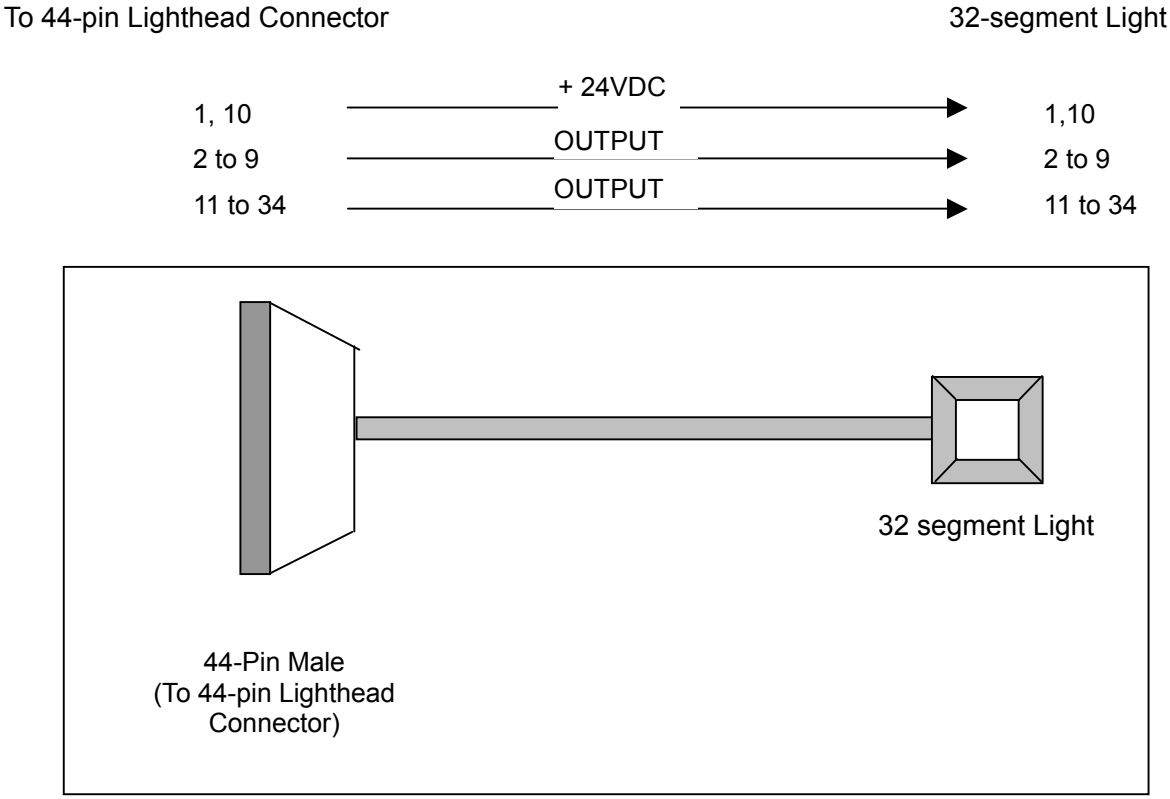
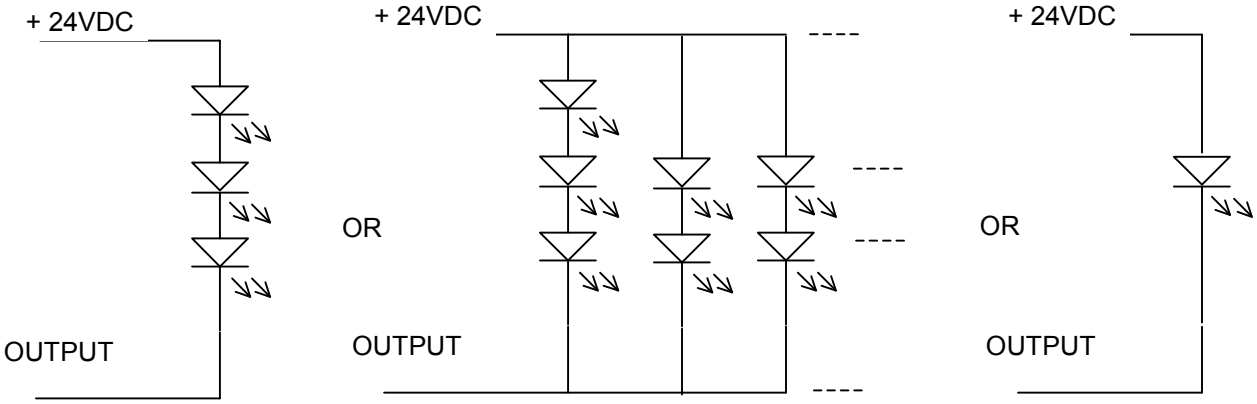


Fig 2.6: Lighthead Cable

LED Electrical Circuitry

The lighthead can be designed according to any of the following LED connectivity options. Few sample circuits are shown below



3 Hardware and Software Installation

This section provides the initial hardware and software installation procedures to work with ICubeC

3.1 Requirements

Following are the required hardware and software components to start the installation

1. **ICubeC Device**
2. **Power Supply**

   A power supply of +24VDC is required for powering the ICubeC

3. **Interfacing cables**

   ICubeC requires 3 types of cables (Power Supply Cable, Master Cable and USB Cable) that comes with package

4. **Software package**

   The Software package includes necessary files to install the API and driver. The application can run in Windows 2000, Windows XP platforms

3.2 Software Installation

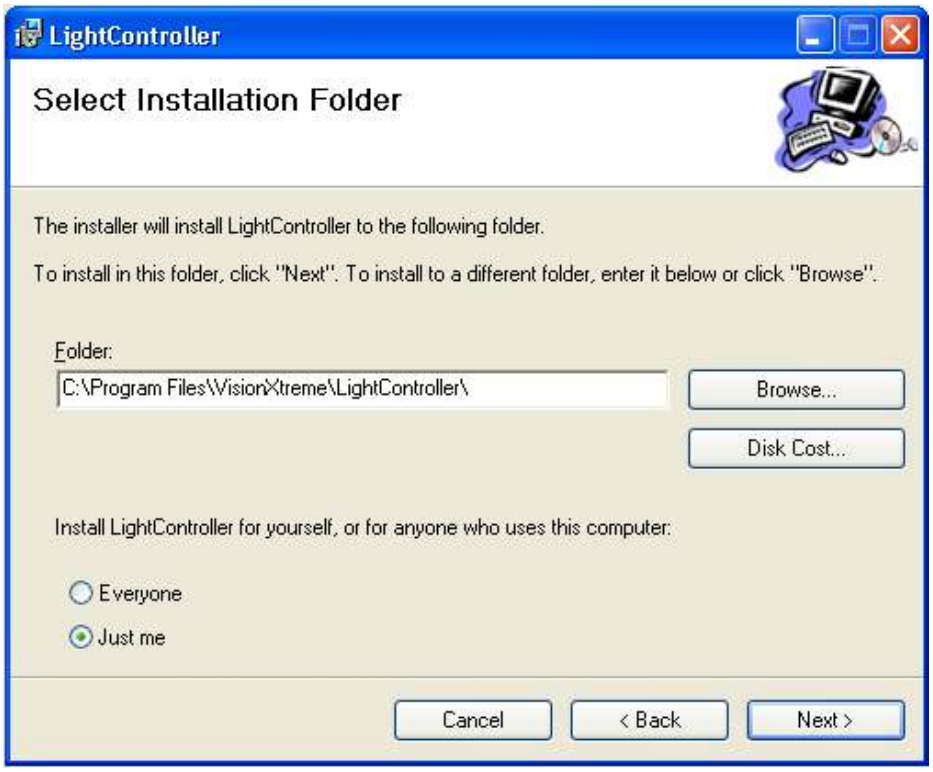
This section explains in detail about the software installation of lighting controller using the setup file provided with the installation disk. Follow the steps below to install the API.

1. Double click the setup file and run

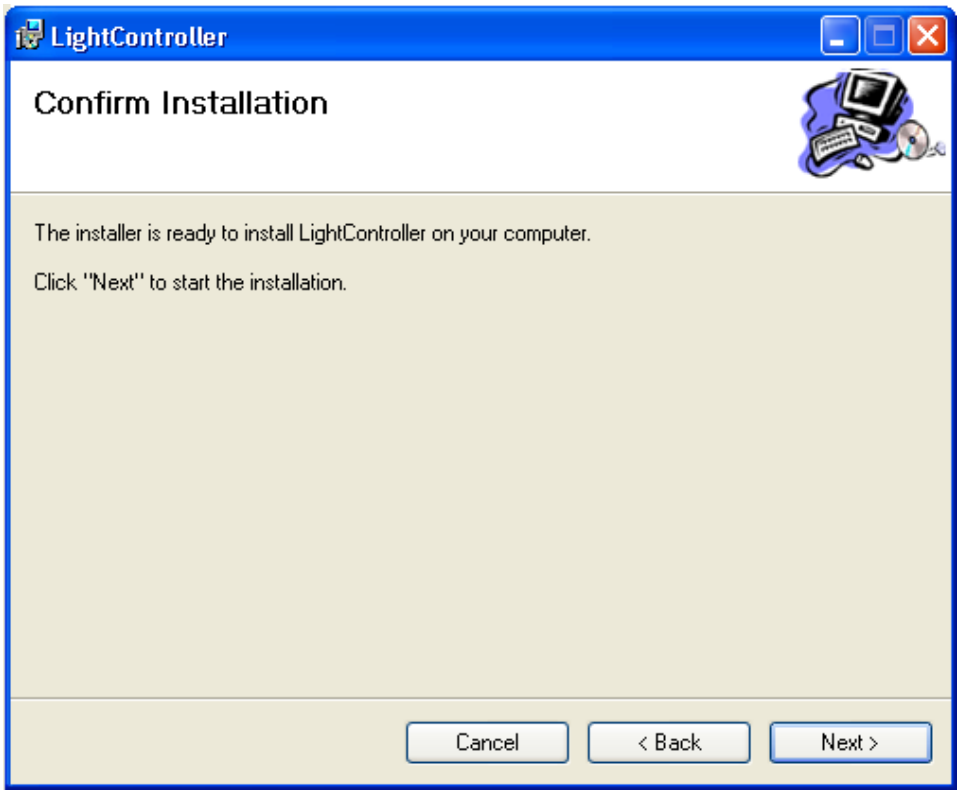
2. The following LightController setup wizard opens. Click **Next** button to continue the setup

LightController
Welcome to the LightController Setup Wizard
The installer will guide you through the steps required to install LightController on your computer.
WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
Cancel
< Back
Next >

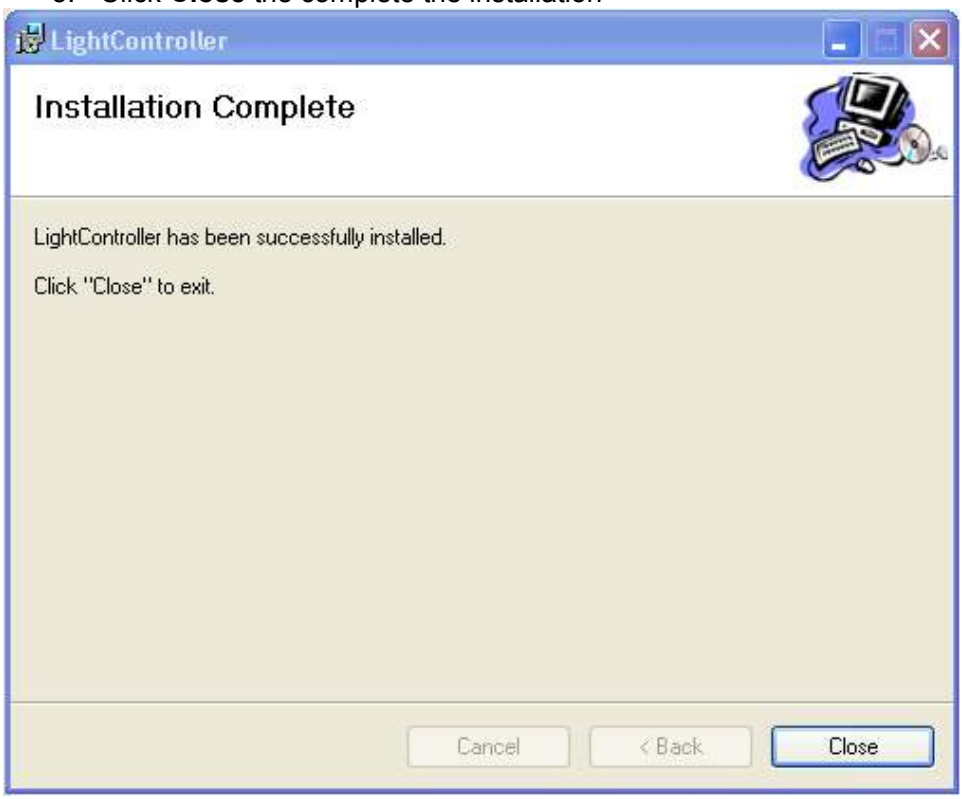
3. Choose the folder you want to install.


LightController
Select Installation Folder
The installer will install LightController to the following folder.
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".
Folder:
C:\Program Files\VisionXtreme\LightController\
Browse...
Disk Cost...
Install LightController for yourself, or for anyone who uses this computer:
Everyone
Just me
Cancel
< Back
Next >

4. Click **Next** to start installation.


LightController
Confirm Installation
The installer is ready to install LightController on your computer.
Click "Next" to start the installation.
Cancel
< Back
Next >

5. Click **Close** the complete the installation



6. You can see the LightController shortcut icon automatically created in the desktop

To start working with LightController, double click on the icon.

3.3 Hardware Installation

- Plug in power cable into the DC Power connector of ICubeC
- Connect the Master cable from camera to the Master connector of ICubeC
- Connect the USB cable from PC USB port to the ICubeC. Check whether the device is detected under the Jungo folder in Device Manager (E.g. ICubeC). This indicates the device is detected.
- Connect the lighthead to the other end of the ICubeC

4 Operations and Features

This chapter explains the basic operations and features of ICubeC. This section also explains the configuration in detail.

4.1 Device Selection

The application for ICubeC runs either in Windows 2000, Windows NT or Windows XP Platforms. This section explains the configuration of various light patterns intensity levels using the API provided. Figure 4.1 shows the appearance of ICubeC application.

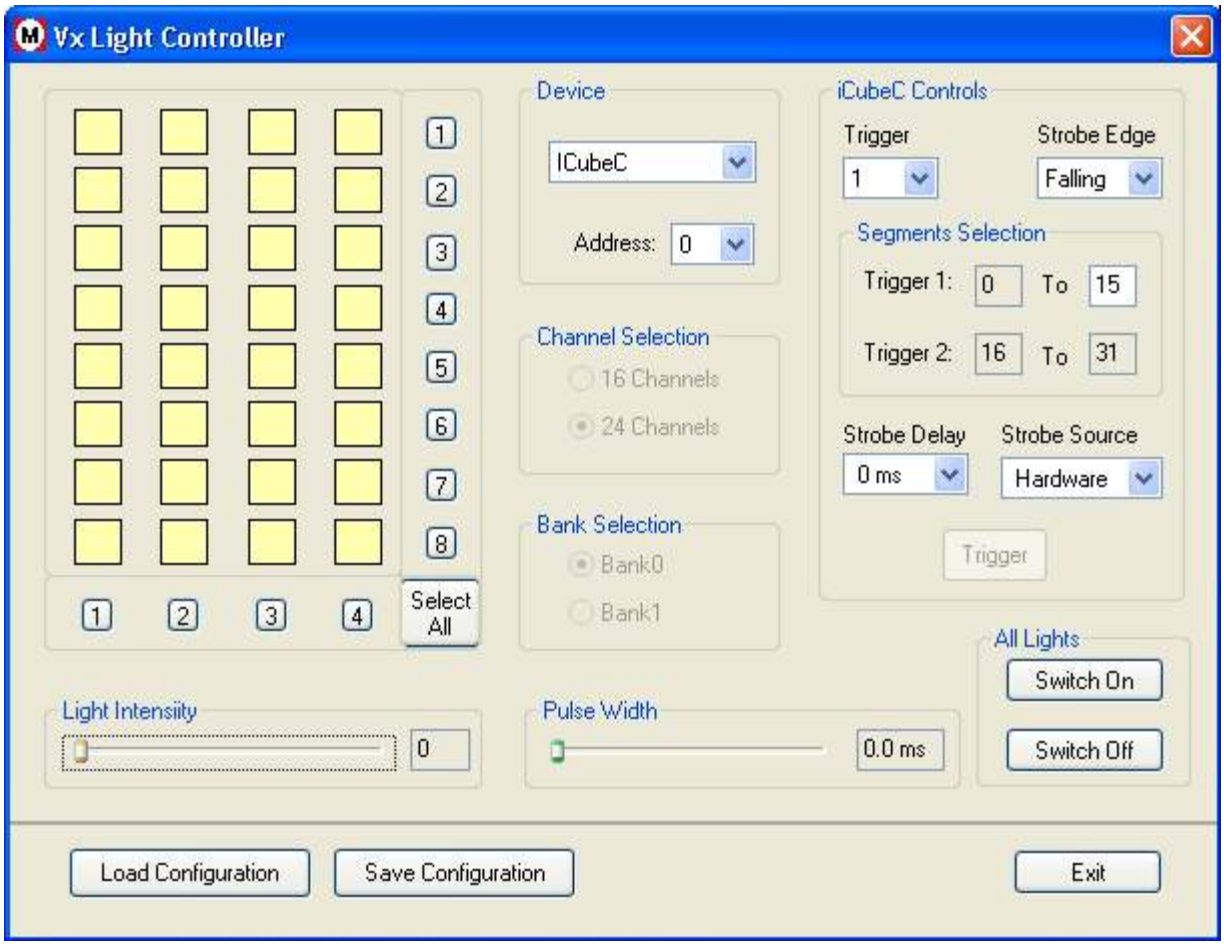


Fig. 4.1: The LightController API

Once the application is opened, ensure "***ICubeC***" is selected under device. If not click on the box as shown in Fig.4.2

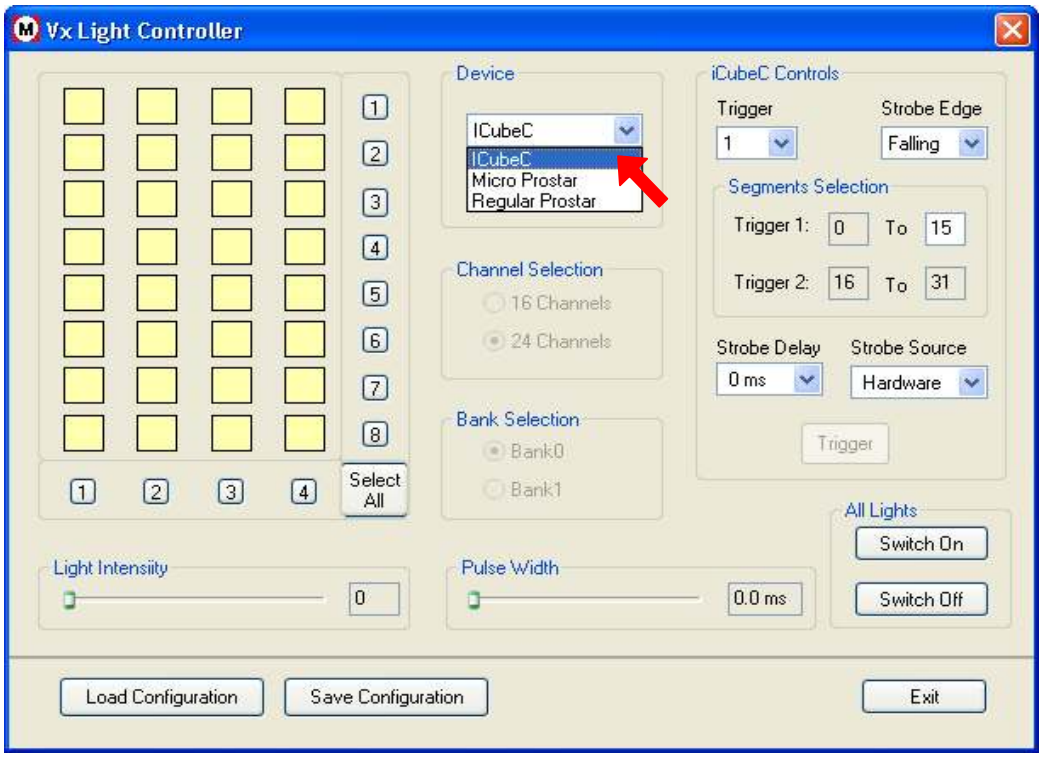


Fig. 4.2: ICubeC Device Selection

If there is no ICubeC device connected to the PC, a message box pops up as shown in Fig.4.3

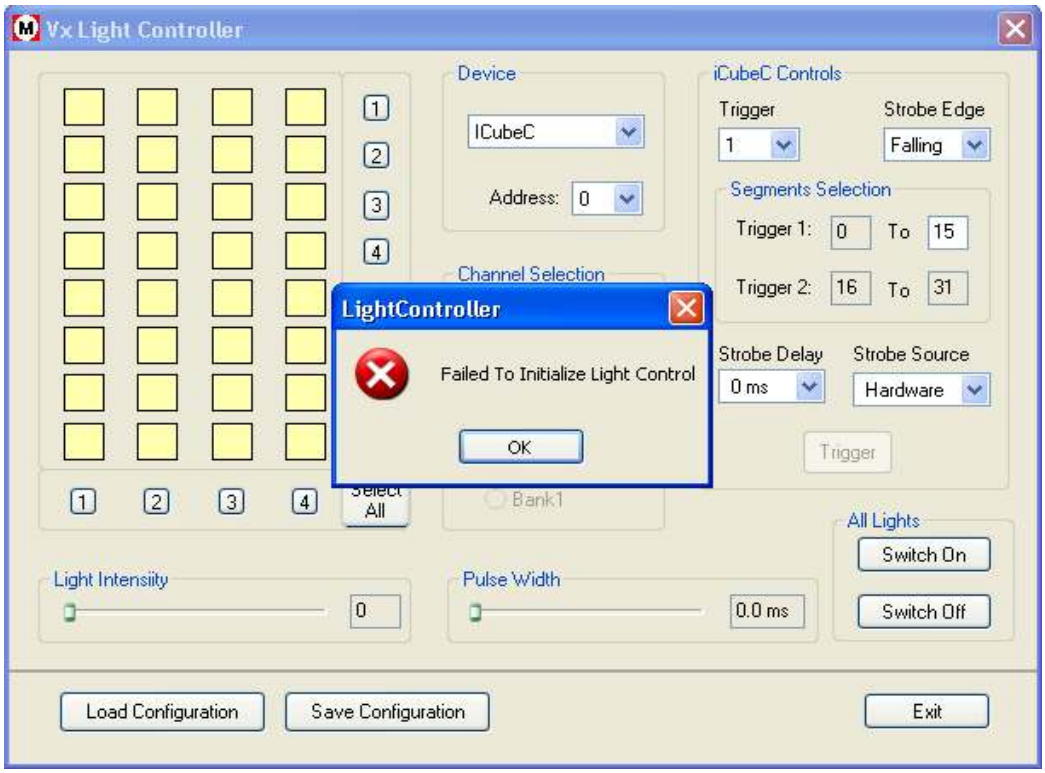


Fig. 4.3: ICubeC Device not detected or connected

4.2 Controllers and Channels

There are 4 Channels namely Channel 1, Channel 2, Channel 3 and Channel 4 per Controller. For example the channels for Controller 2 are shown in Figure 4.4. Similarly, there are 8 Controllers namely Controller 1, Controller 2, Controller 3, Controller 4, Controller 5, Controller 6, Controller 7 and Controller 8 as shown in Fig.4.4.

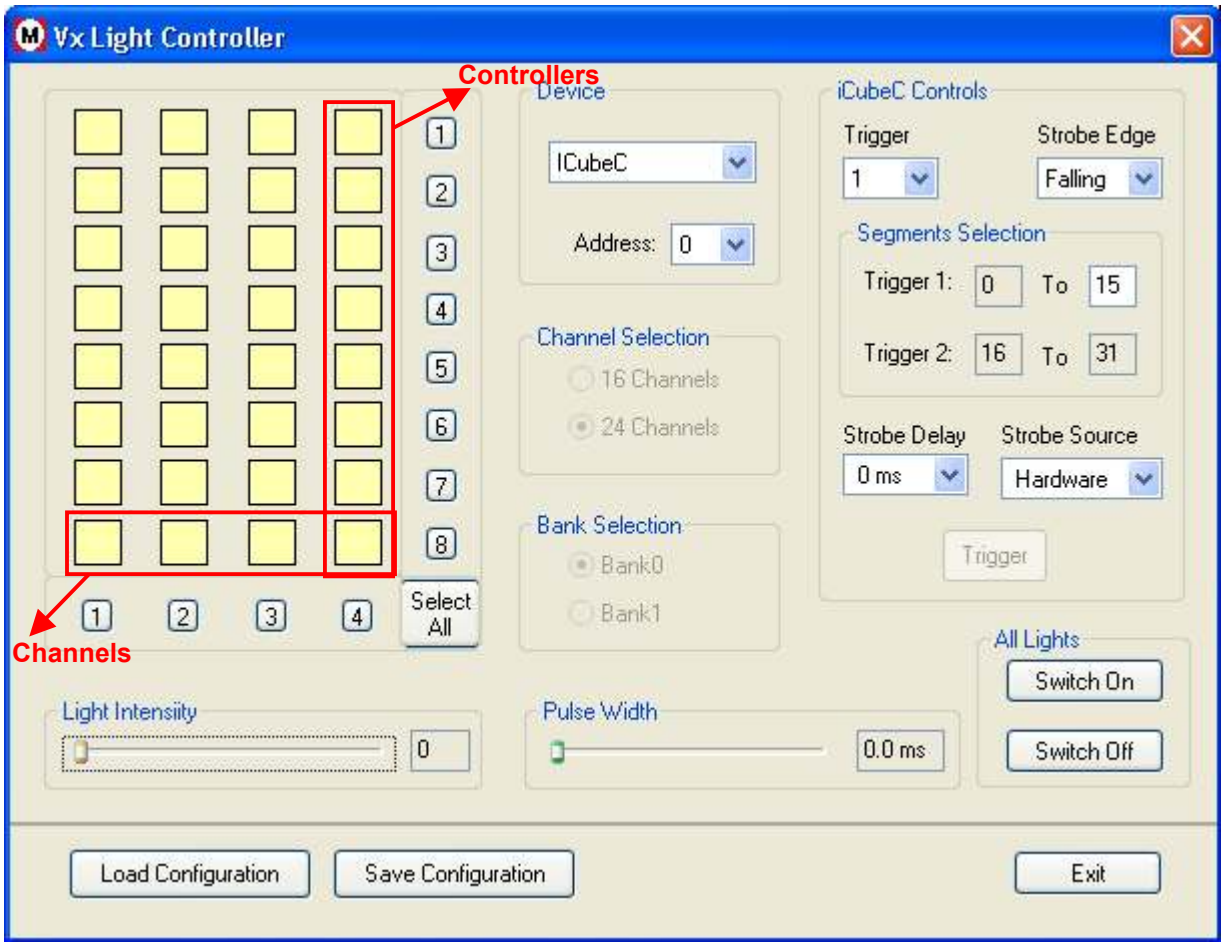


Fig.4.4: Channels and Controllers for 32 Segment Light Head

There are 32 segments in ICubeC, which can be controlled individually. To control all the 32 segments, enter '31' in the text box shown in fig. 4.5 under segment selection – Trigger 1 and select Trigger '1' as shown in the fig. 4.5. If Trigger '2' is selected, any number of segments less than 16 has to be entered for Trigger '1' and the remaining segments will automatically be assigned for Trigger '2'. One example is shown in fig. 4.6.

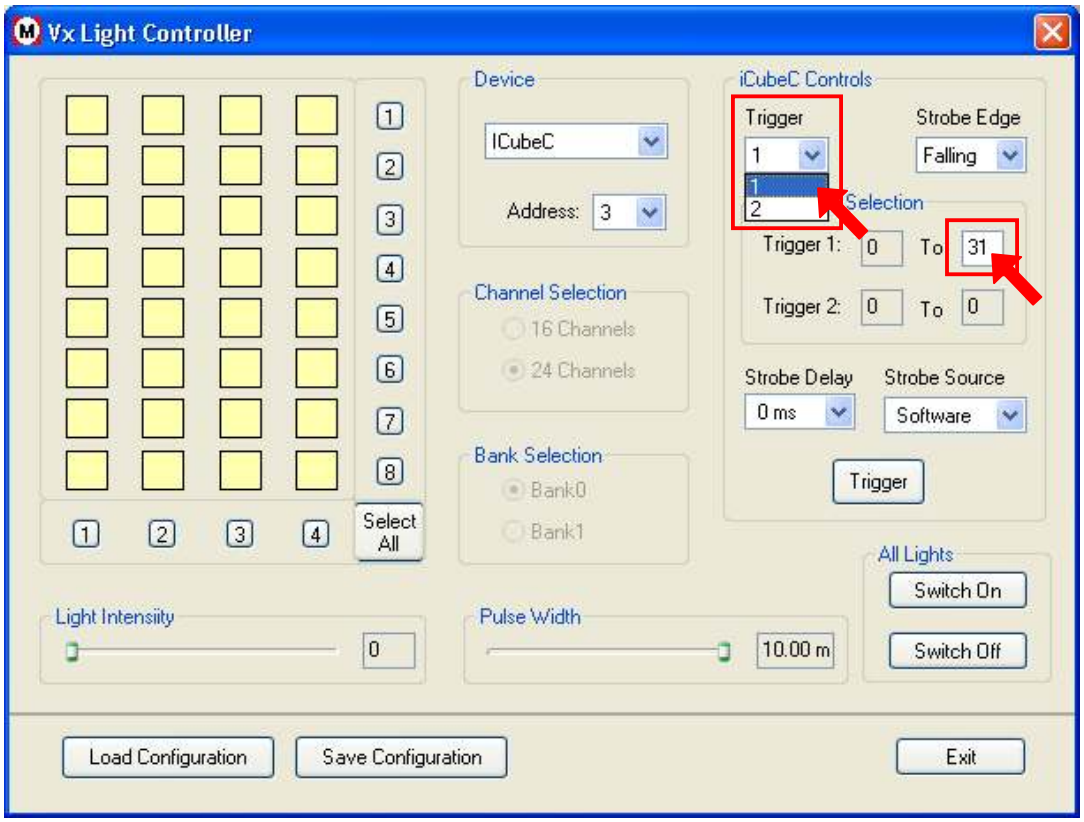


Fig.4.5: 32 Segments selection for Trigger 1

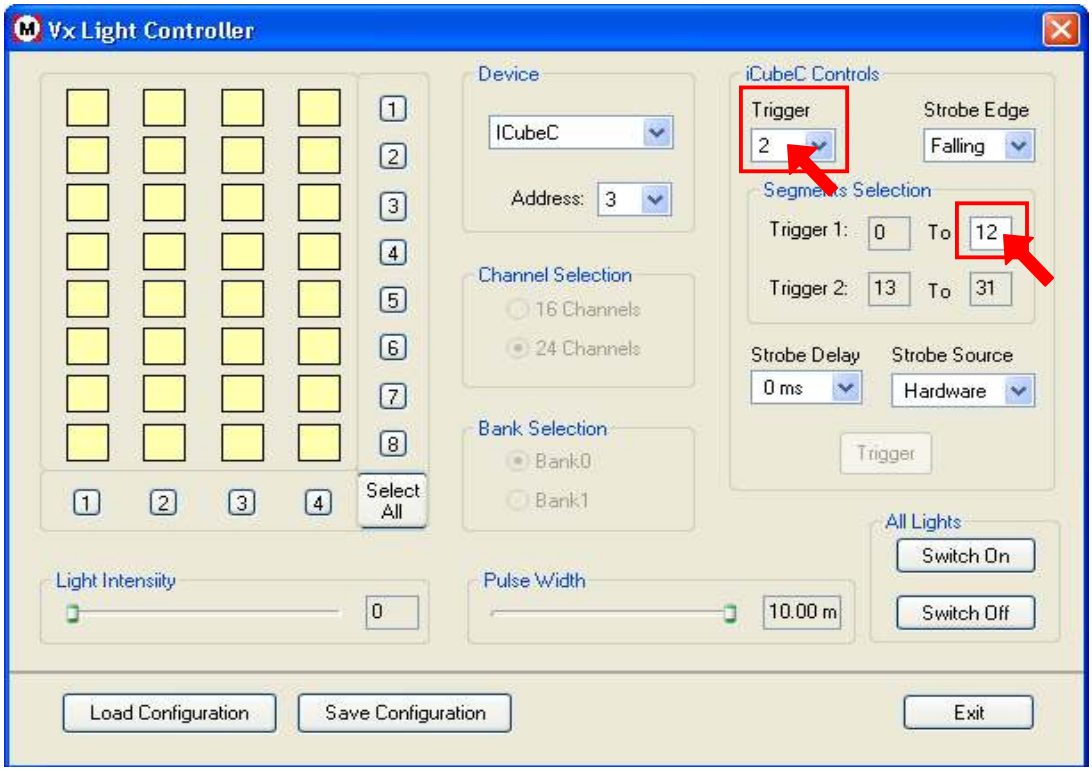


Fig.4.6: Segments selection for Trigger 2

4.3 Other Features

4.3.1 Strobe Pulse width and Intensity variation

This feature is provided to vary the pulse width of the strobe output from ICubeC with respect to the Trigger from camera or internal strobe. The strobe output of ICubeC decides the Turn on time of the light. The pulse width of the strobe output from ICubeC should be less than the pulse repetition period of the camera strobe signal.

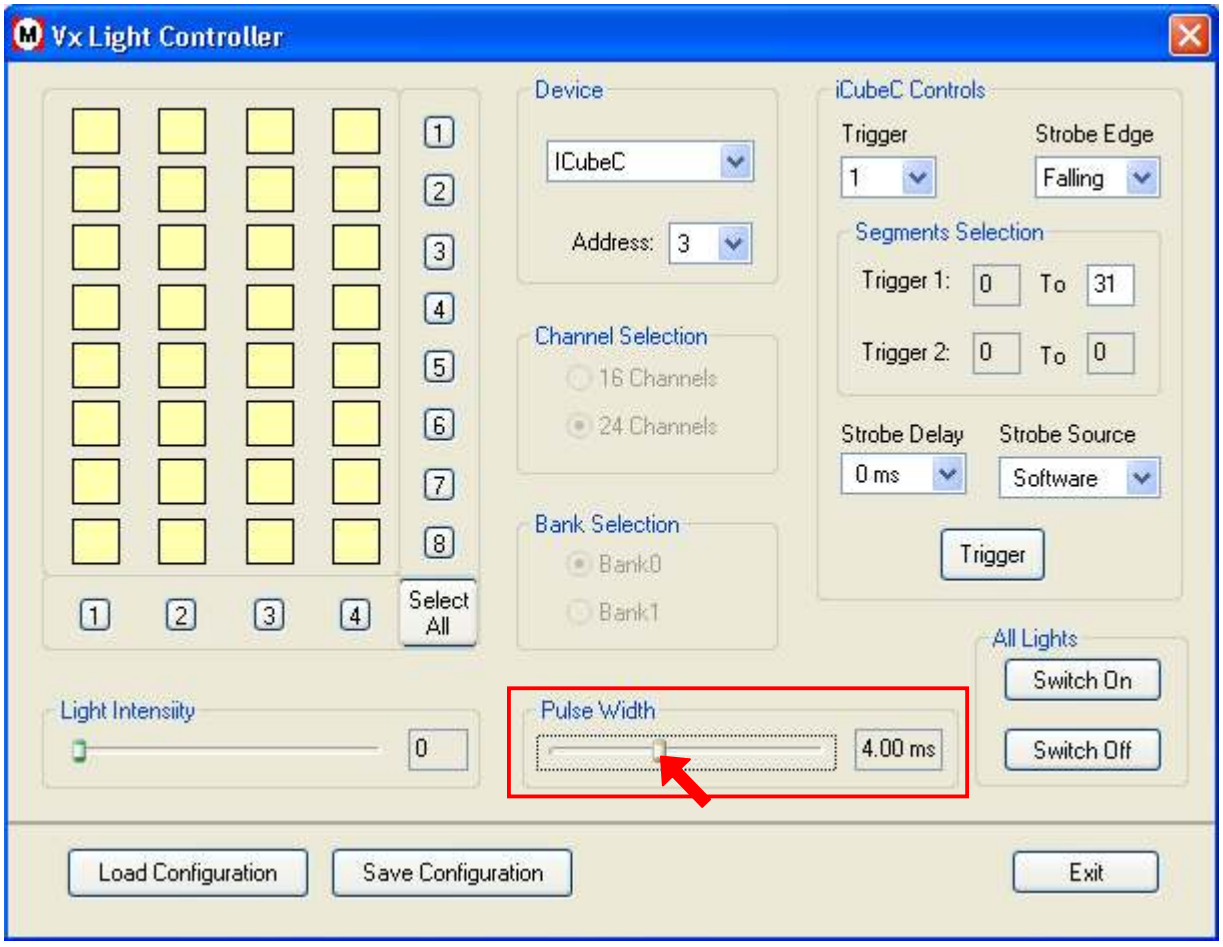


Fig. 4.7: Pulse width variation

User can also adjust the intensity variation for the selected segments. The intensity can be varied from 0 to 63 as shown in fig.4.8

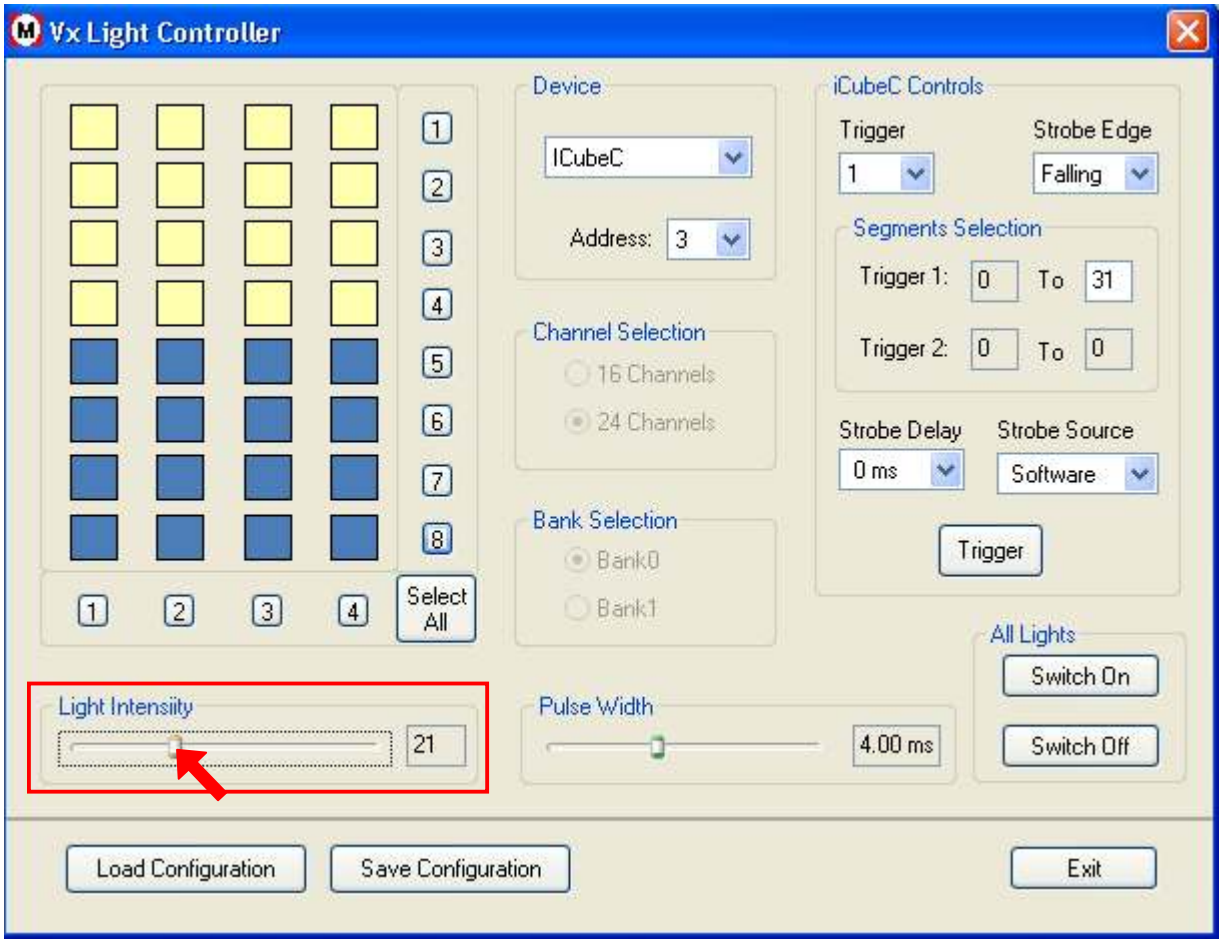


Fig. 4.8: Light Intensity variation

4.3.2 Strobe Source and Edge selection

External: Select “External “from the Strobe Selection option box. In this case, triggers have to be sent from the external 9-pin D Type connector to the Trigger 1 pin. Note that the input trigger voltage from at maximum of 5 Volts and the frequency should be limited to maximum of 10 pulses/sec. External control maybe used for connecting to a camera to a frame grabber output pin depending upon the requirement.

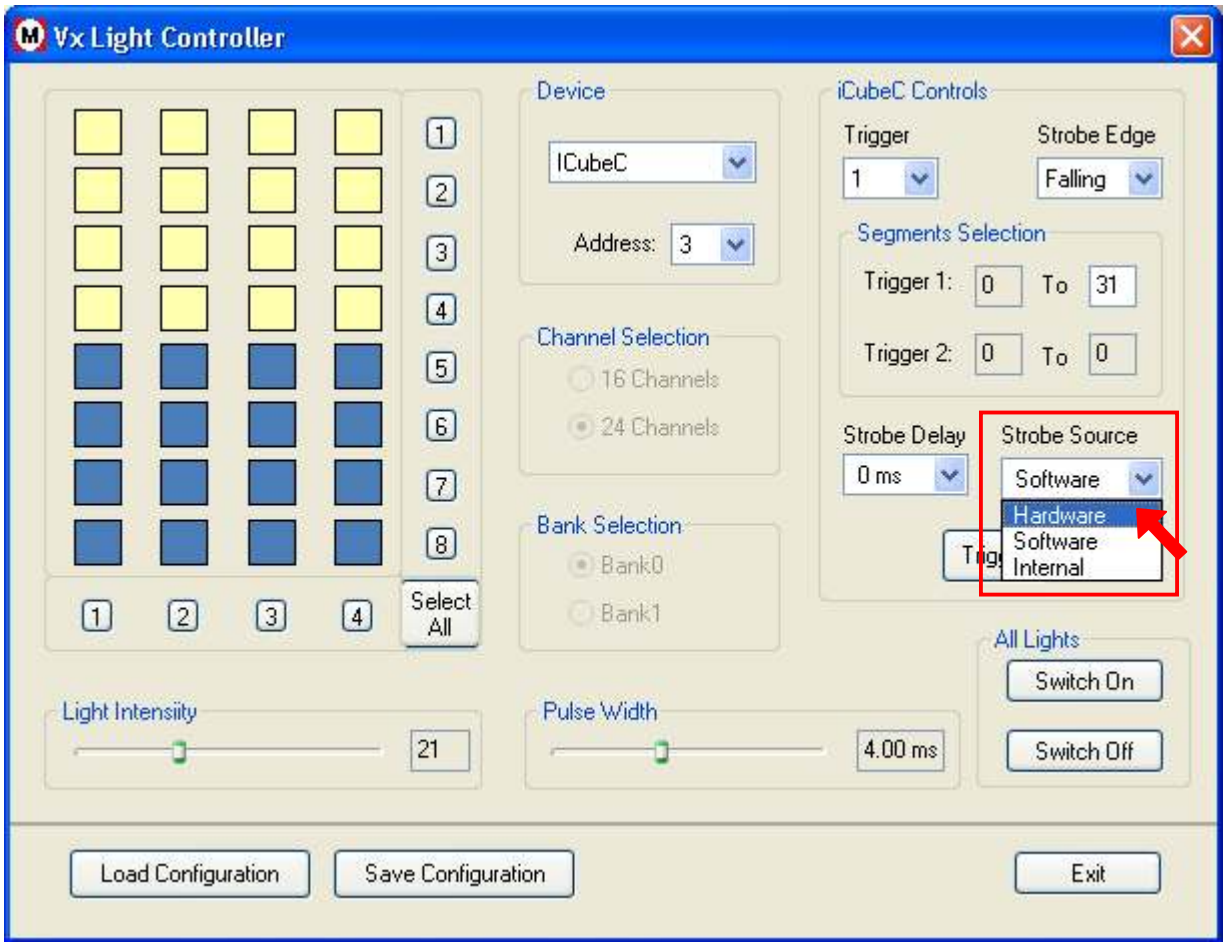


Fig. 4.9: Strobe source Selection

Software: When “Software” strobe source is selected, the “Trigger” button is visible. Clicking on this button once will send a software strobe to the device.

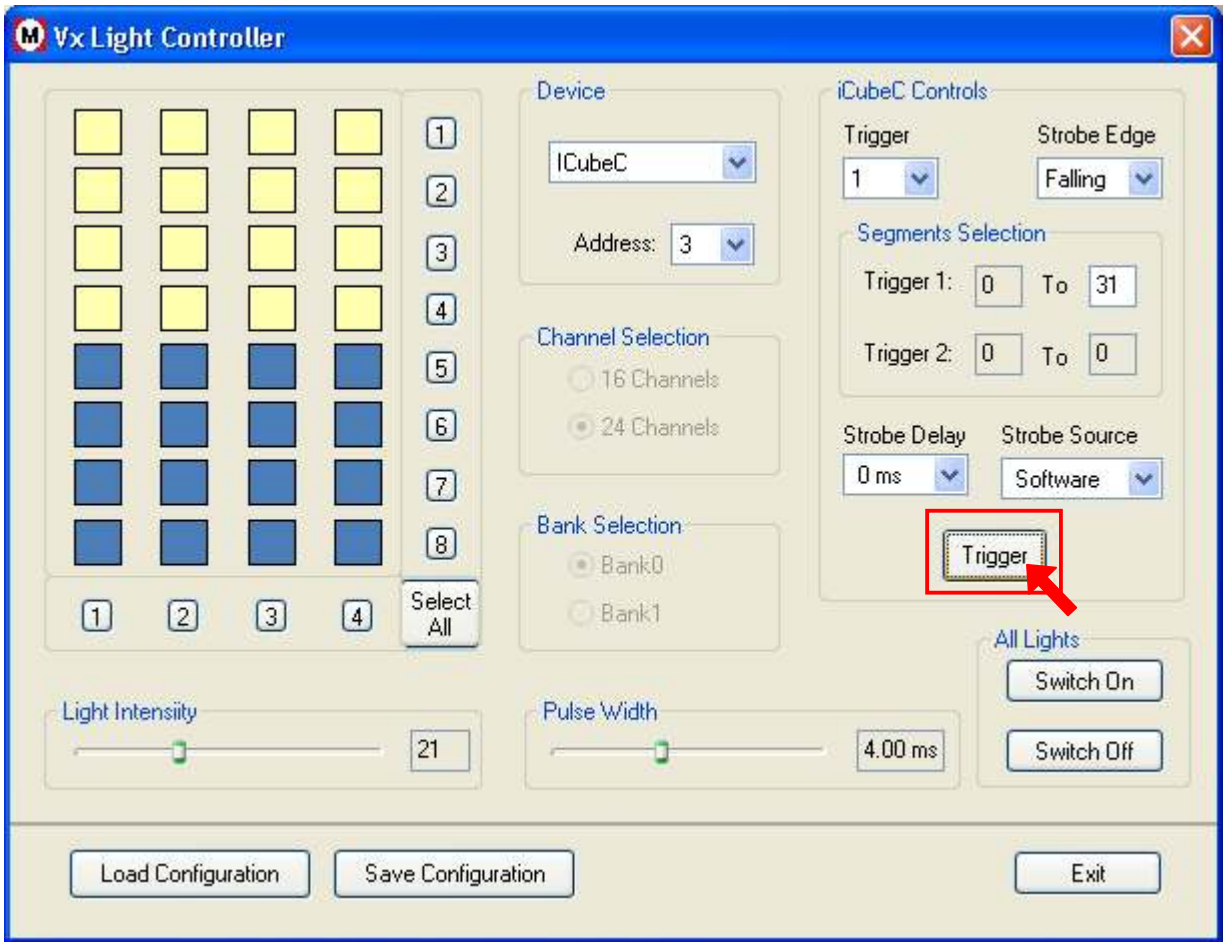


Fig. 4.10: Software strobe from API

Internal: "Internal" is used or Diagnostics purpose only.

(Note: Any frequency higher than 10 pulses/sec will damage the controller)

Select "Rising" from the Trigger 1 Edge Select option box. Take note: It can also be falling edge depending on your current interface. The purpose of this edge selection to enable the user to synchronies the input trigger to either of the edges. This is usually required when different configurations of sensors are used. For e.g. If Trigger 1 is triggered at the "Rising edge" and if you see a faint and no image at all from the camera, then try setting the edge to "Falling edge". Note that the illumination controller has option to connect to 2 lightheads and there fore there is an option to control the edges for both Trigger 1 and Trigger 2.

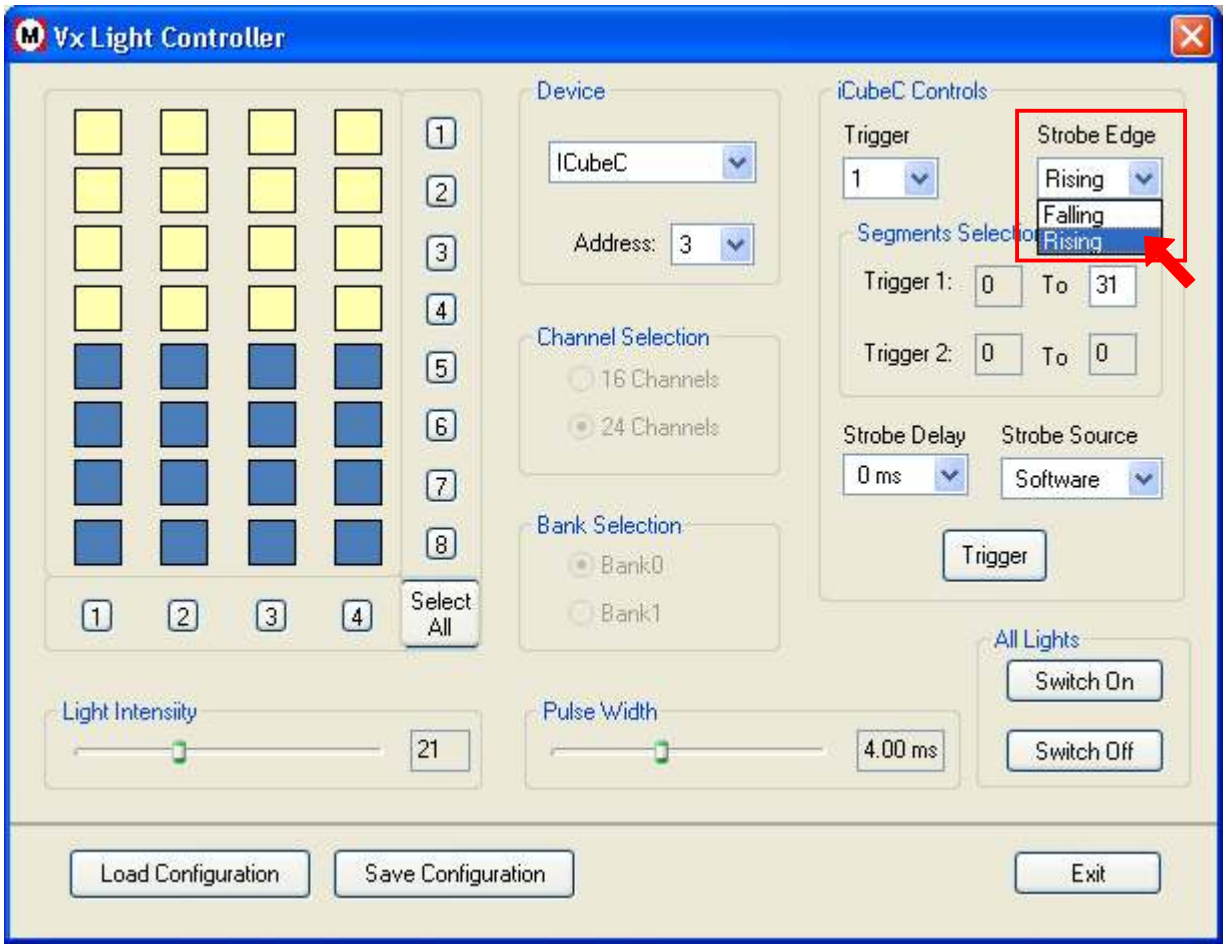


Fig. 4.11: Strobe Edge Selection

Now the Light head that is connected to the ICubeC starts blinking with the selected pulse width and intensity, provided an external trigger has been connected to the 9-pin connector. If user does not see any flashing, try selecting internal strobe

4.3.3 Strobe Delay Selection

The ICubeC offers an option to trigger the camera. This is provided to ensure that the Light intensity has reached the saturation point before the camera is exposed. More consistent and clear images are acquired using this method. In the event, you want the ICubeC to send strobe signal to camera then select a delay 0 / 50us / 100us under *STROBE DELAY* option. Example: 50us is selected at the “Strobe Delay” option box. What this means is that the light will first turn ON and after a delay of 50 ns, a signal to send to the camera via the CAMERA STROBE signal available 9 PIN D TYPE connector.

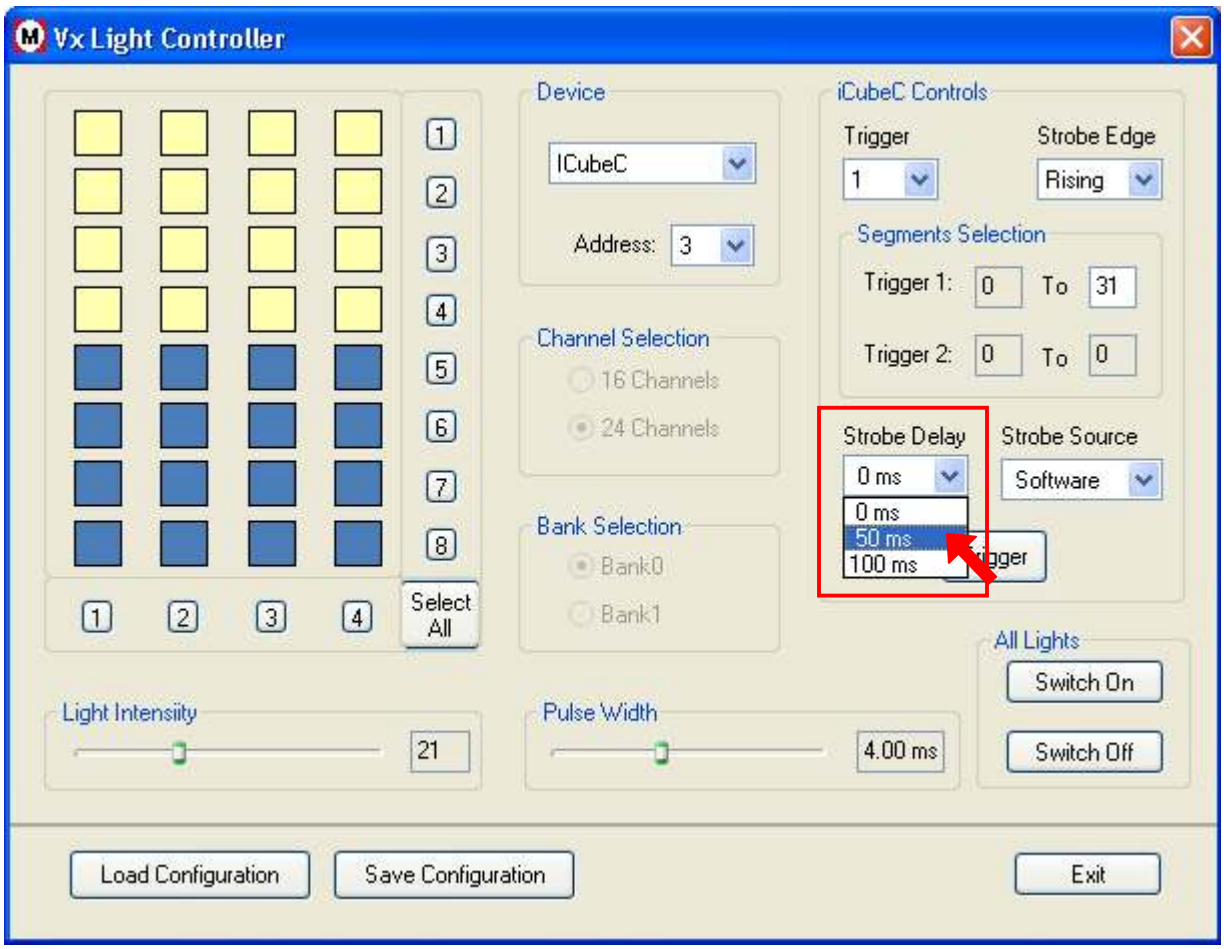


Fig. 4.12: Strobe Delay Selection

4.3.4 Saving/Loading multiple configurations

Save and Load Configuration features are includes in the API for strong multiple configurations and loading the configuration on to the ICubeC for quick setup.

Save Configuration:

This option is provided to save the light configuration settings. Number of configuration files saved depends on the hard disk capacity.

Load Configuration:

This option is provided to load the saved configuration settings on to the ICubeC. Pre-stored files can be reloaded for quick setup.

Exit:

This option is provided to close the ICubeC application.

4.4 Steps to be followed for configuring ICubeC

Step 1: ICubeC Address Selection

If more than one ICubeC is used then, the first requirement is to select the ICubeC, which is supposed to be configured. Selection of ICubeC3 is shown in fig.4.13

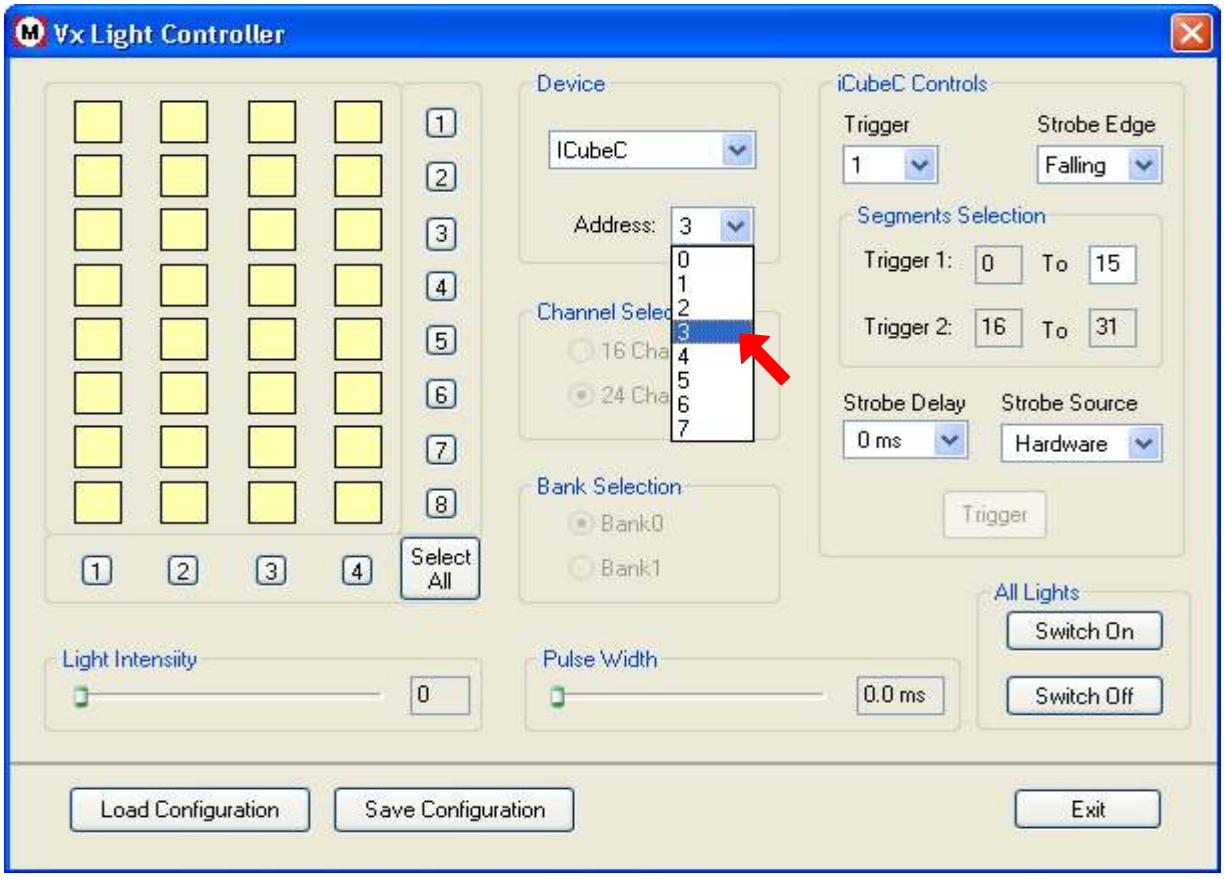


Fig. 4.13: ICubeC Address selection

Step 2: Light Segment Selection

Choose the configuration style from below, and then follow the steps given with respect to the required configuration style.

Configuration Styles:

- Selection of all lights.
- Selection of individual light or group of lights.

(a) Selection of all lights:

- All lights (i.e. all controllers and channels) are selected by simply clicking the box as shown in figure 4.14.
- The intensity value at selection is zero.

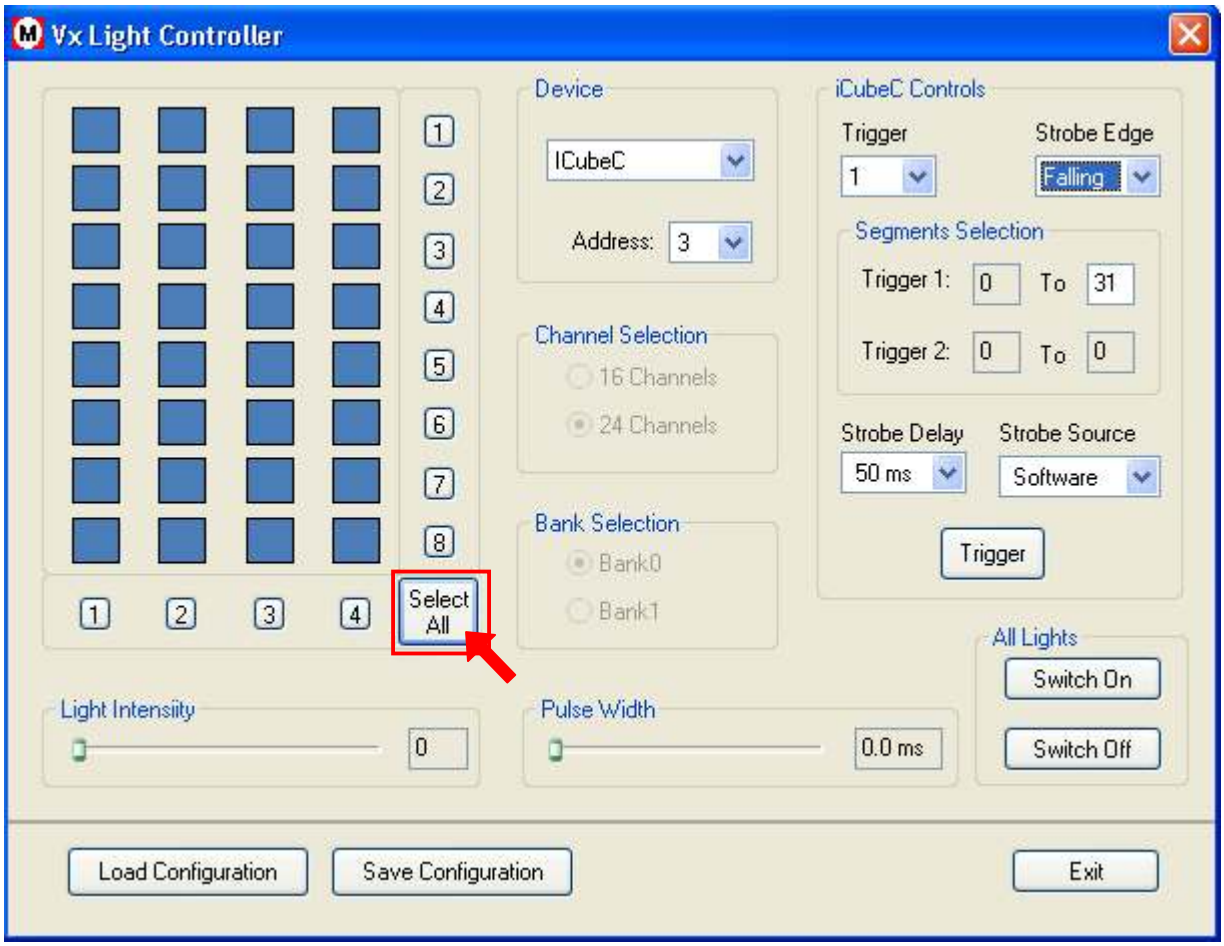


Fig 4.14: Selection of all lights

(b) Selection of individual light segment:

Select the light segment required to be configured as shown in figure 4.15. For example Controller 3,Channel 1 is selected in figure 4.15.

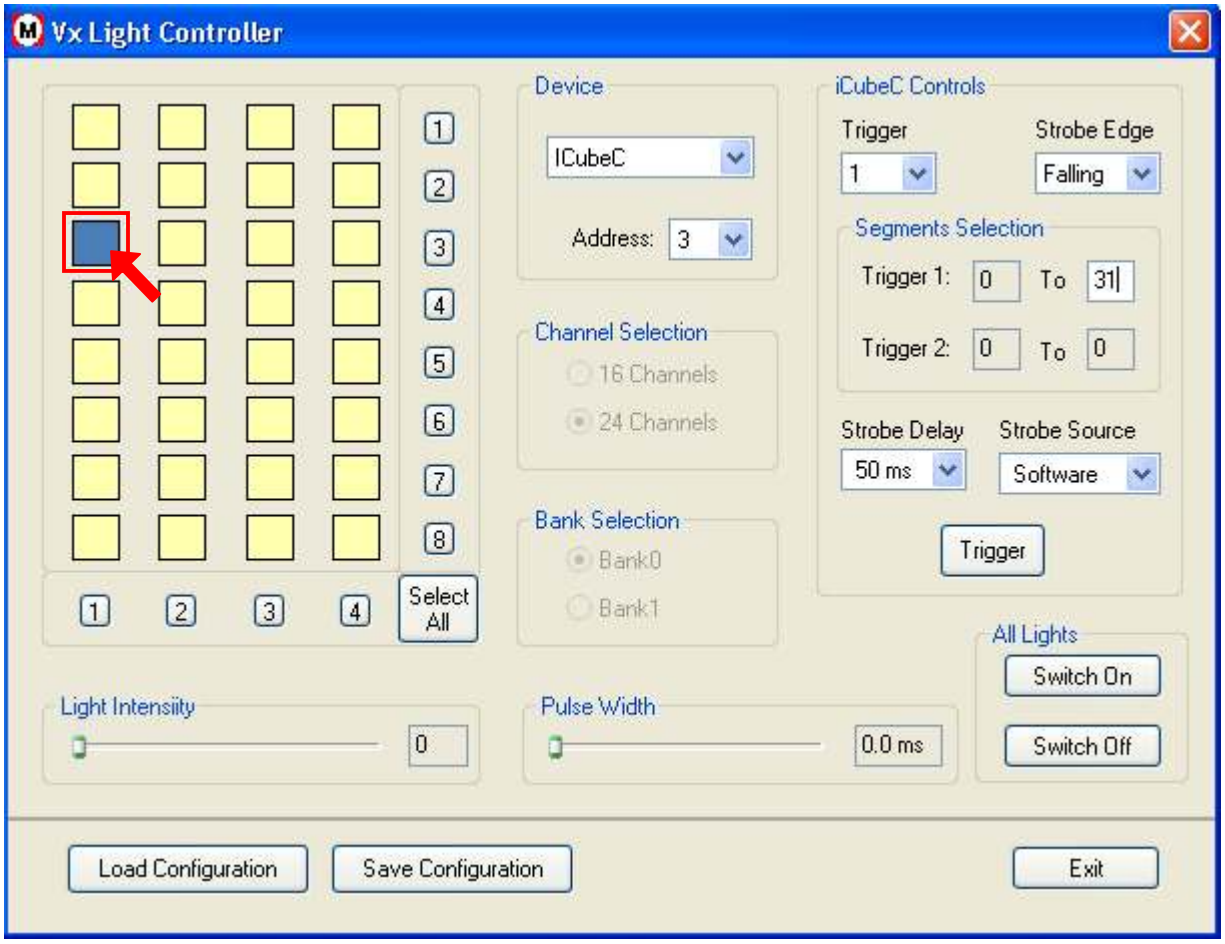


Fig 4.15: Selection of Individual light segment (Controller 2,Channel 0)

(c) Selection of Group of Lights:

- If the requirement is that all the controllers are to be selected for a particular Channel, then click the corresponding button number of controller for that channel. Refer Fig.4.16.
- If the requirement is that all the channels are to be selected for a particular Controller, then click the corresponding button number of channel for that controller. Refer Fig.4.17

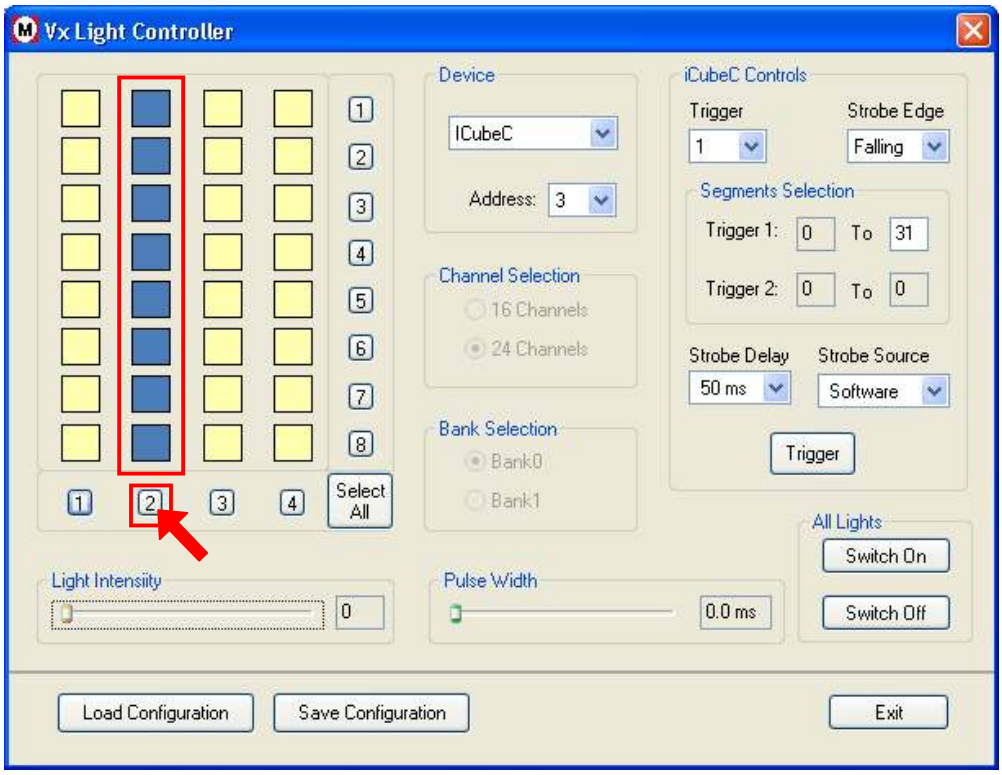


Fig 4.16: Selecting all controllers of channel 2

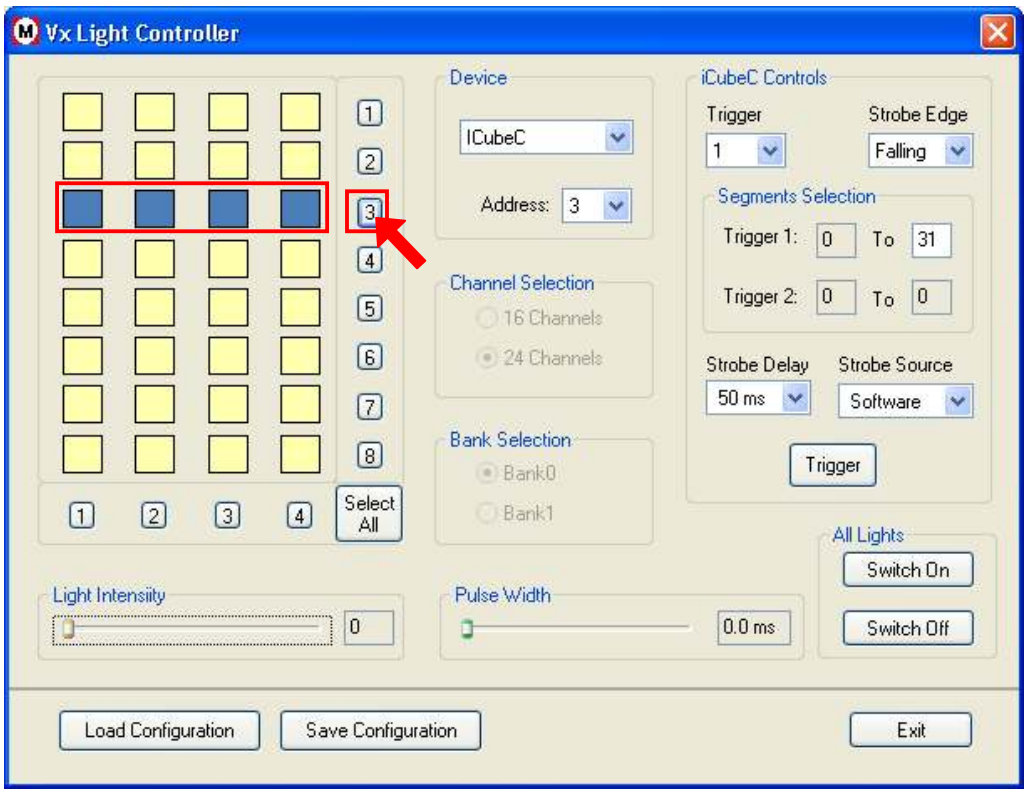


Fig 4.17: Selecting all channels of Controller 3

Step 3: Light Intensity Selection:

- Light Intensity value can be varied from 0 to 63.The value 0 represents the minimum intensity and the value 63 represents the maximum intensity.
- The light intensity required to be set could be obtained by moving the cursor between minimum and maximum value as shown in figure 4.18.

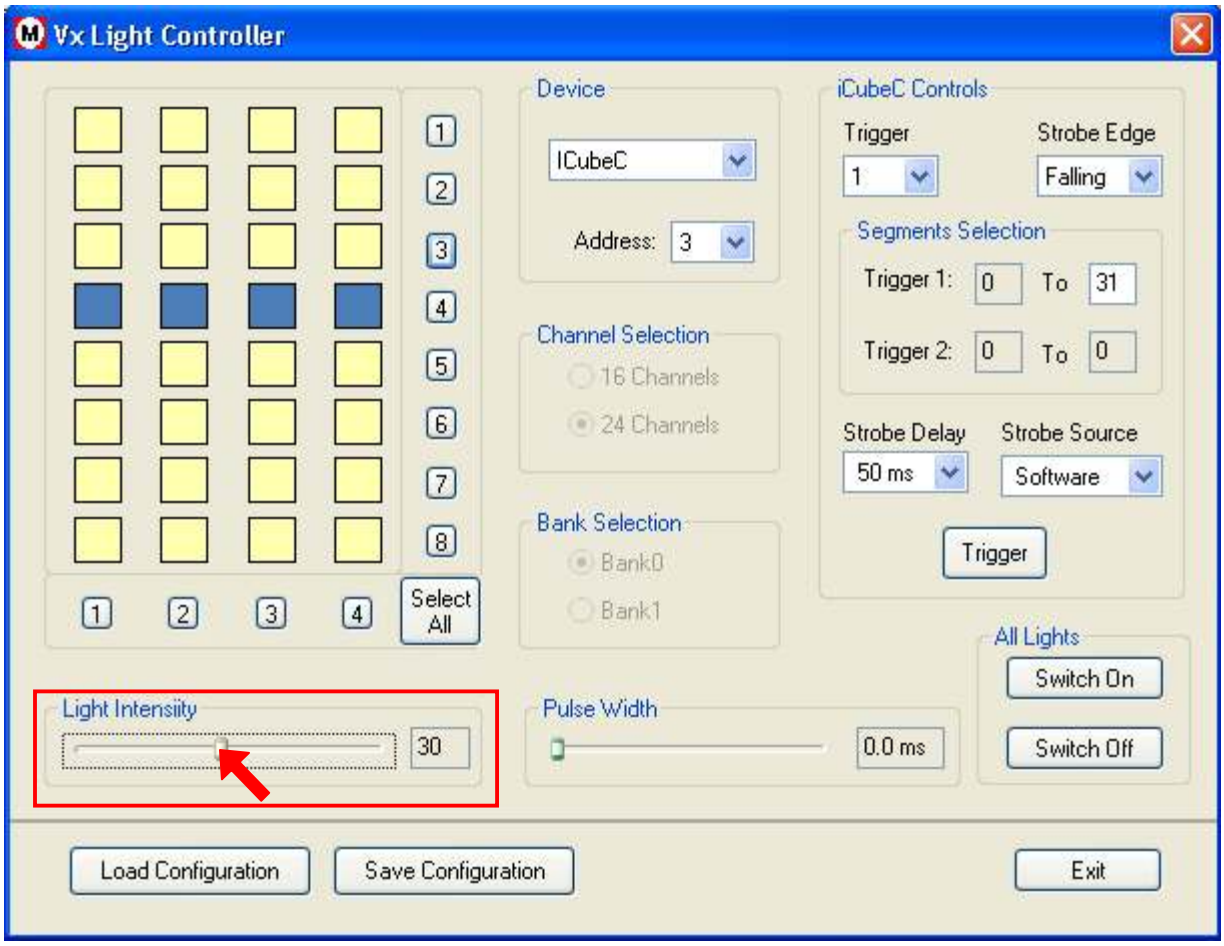


Fig 4.18: Light Intensity value set to 30 for all channels of controller 4

Example: To set maximum intensity value for all light segments, first select all light segments then move the cursor to intensity value 63. Please refer to figure 4.19 and figure 4.20.

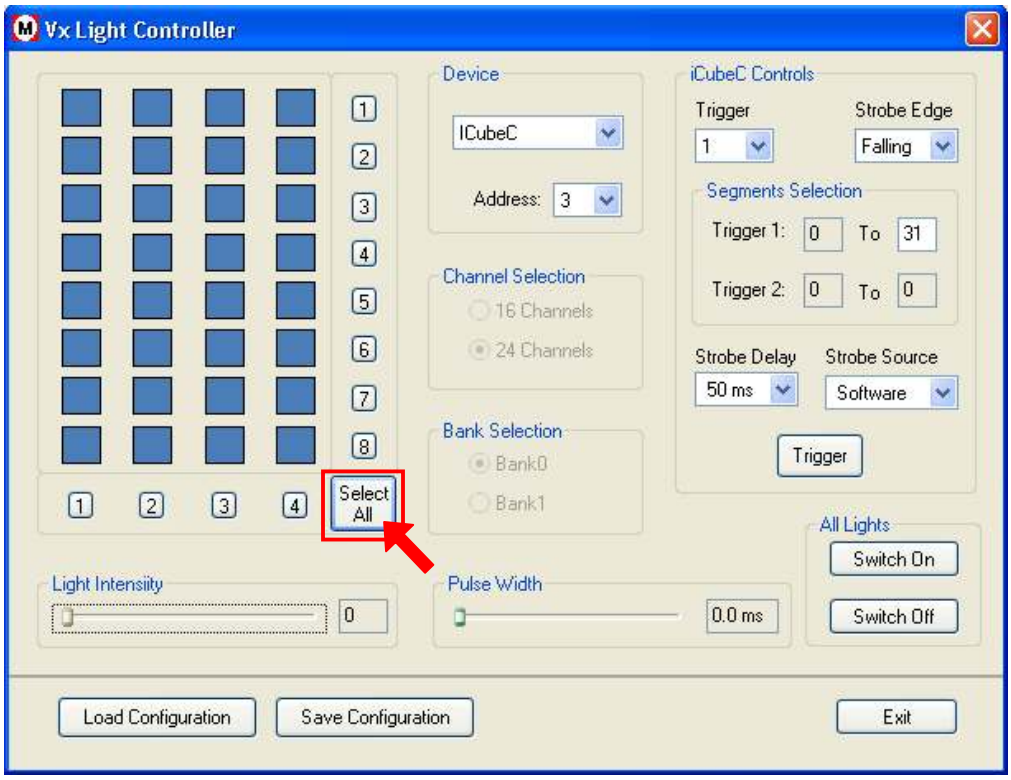


Fig 4.19: All light segments are selected.

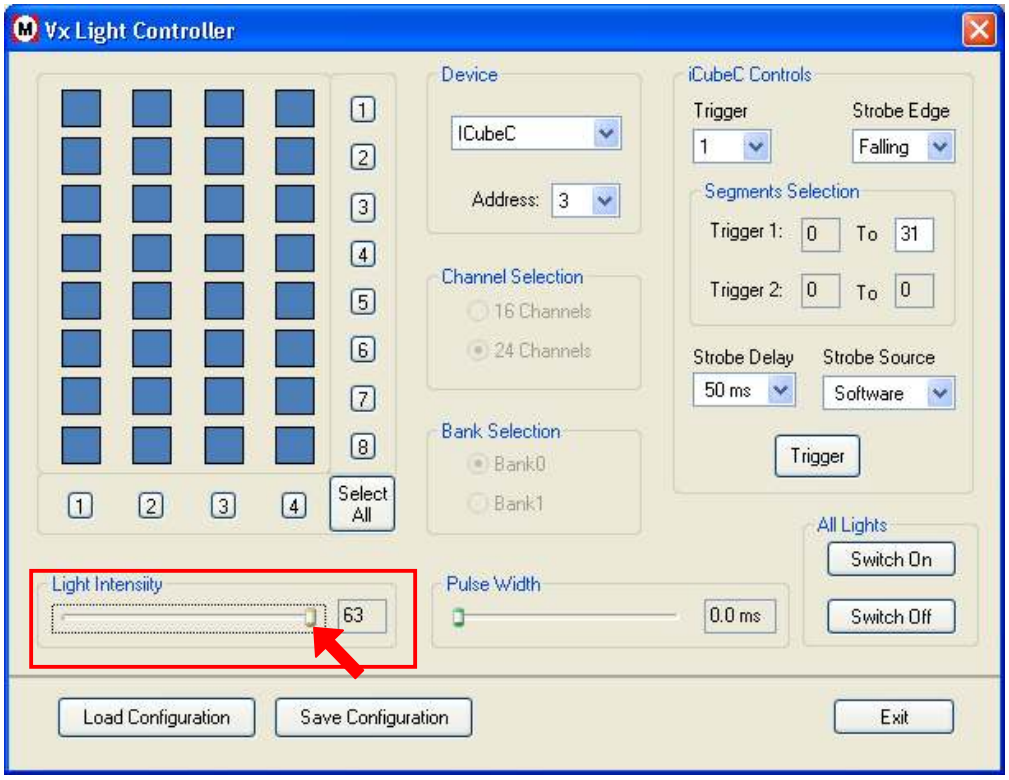


Fig 4.20: Intensity value is set to 63

Other method to Switch on all light segments with maximum intensity:

All Light segments can be switched on at one time to a maximum intensity by clicking the *"Switch On"* button without selection of any controller and channel as shown in figure 4.21.

It can be switched off by clicking the *"Switch Off"* button.

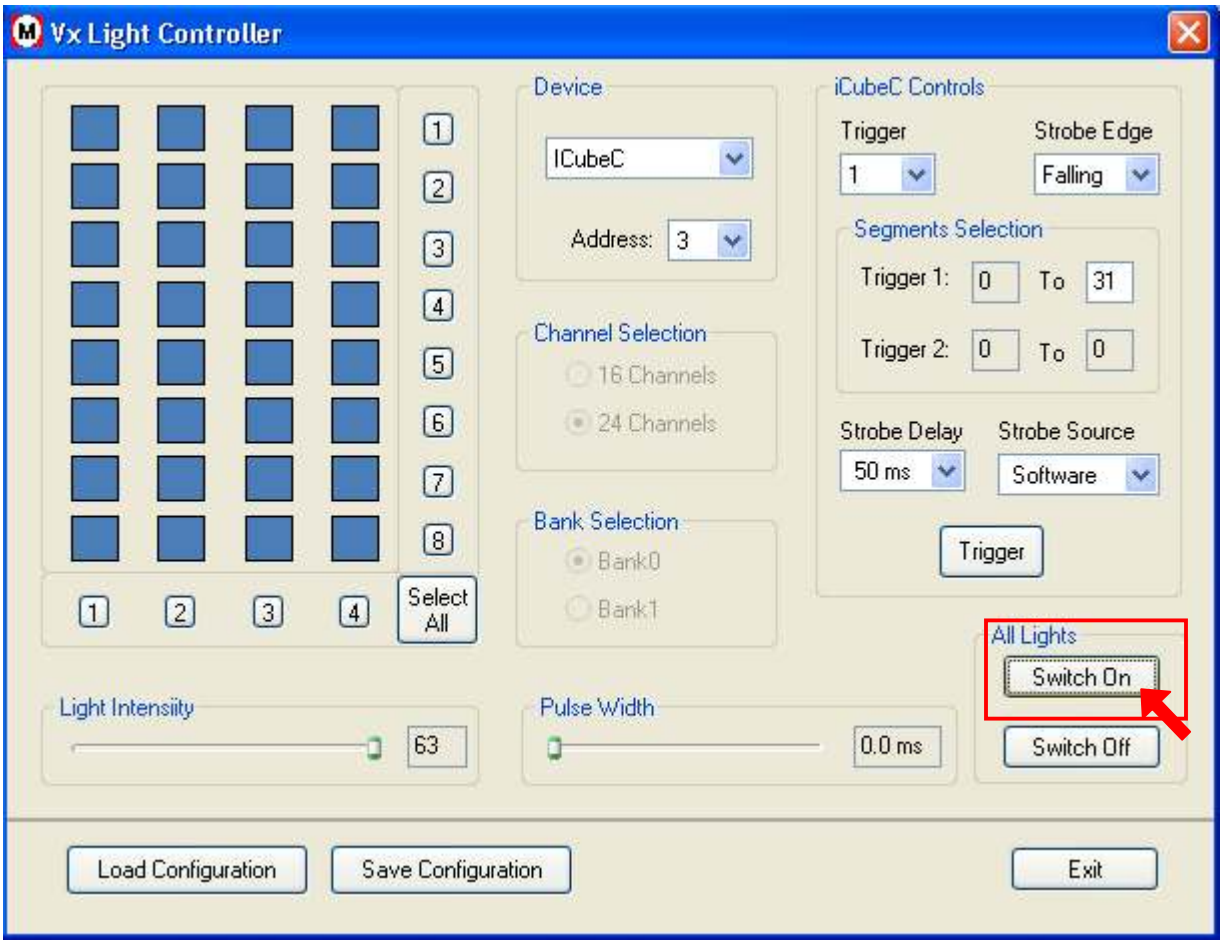


Fig 4.21: All light segments switched on to maximum intensity

If different Light intensity values are set for different controllers and channels and if the requirement is such that all the intensity values of the controllers and channels needs to be increased uniformly in steps of one, then it could be implemented using the Up and Down arrow buttons in keyboard.

Example: Consider controller 1 is set to intensity value 10, controller 2 is set to 20, controller 3 is set to 30 and controller 4 is set to 40, then by clicking the Up arrow once, the intensity value of the controllers will get increased uniformly by one i.e., intensity value of controller 0 is set to 11, controller 1 to 21,controller 2 to 31,controller 3 to 41.To decrease the intensity by one step, use the Down arrow button.

Step 4: Saving the configuration

The entire configuration set can be saved for future usage. The Configuration data can be saved in the location/ folder, where the ICubeC application is placed or in any other preferred directory. The configuration data is saved with *.pro* extension. Figures 4.22 and 4.23 illustrate how to save configuration.

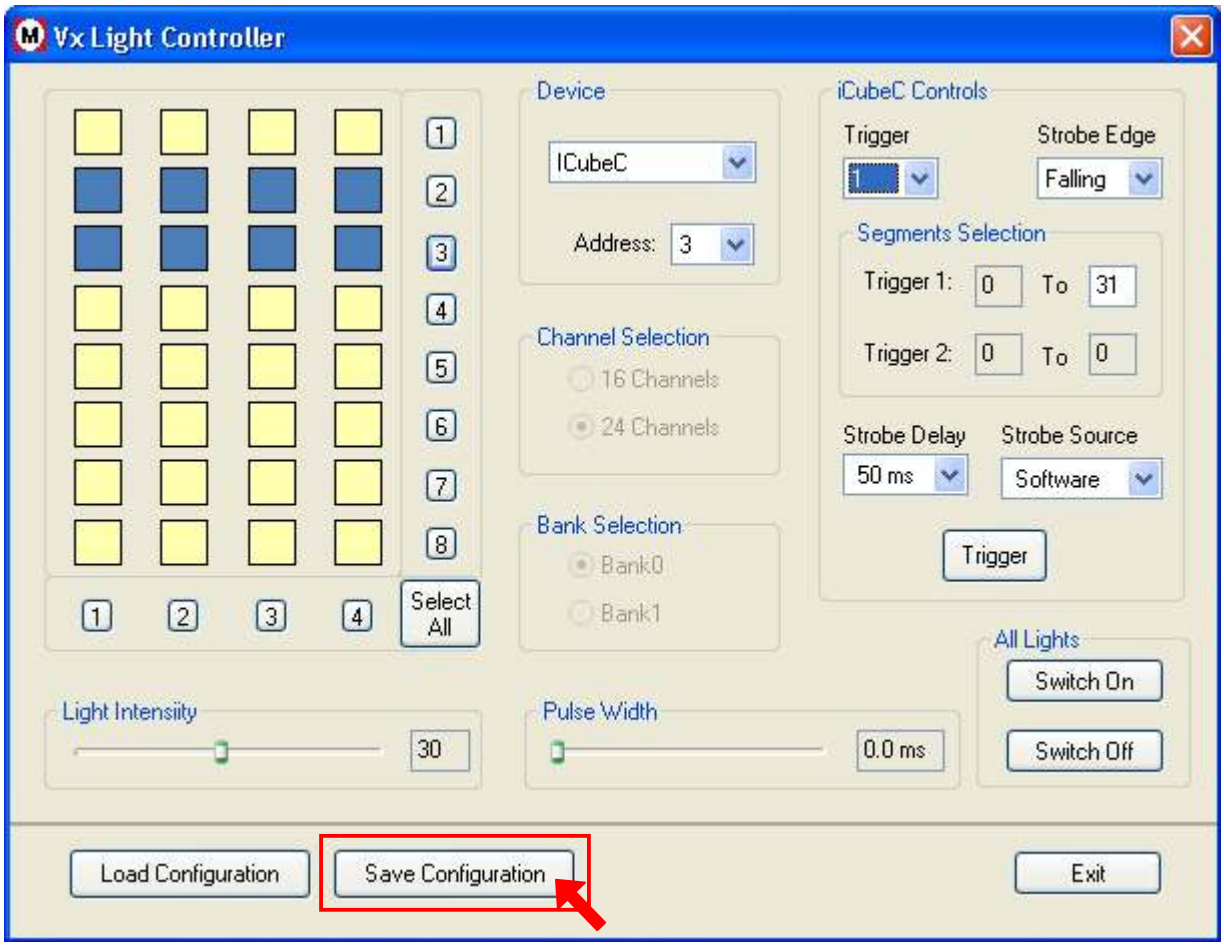


Fig 4.22: Click the "Save Configuration" Button.

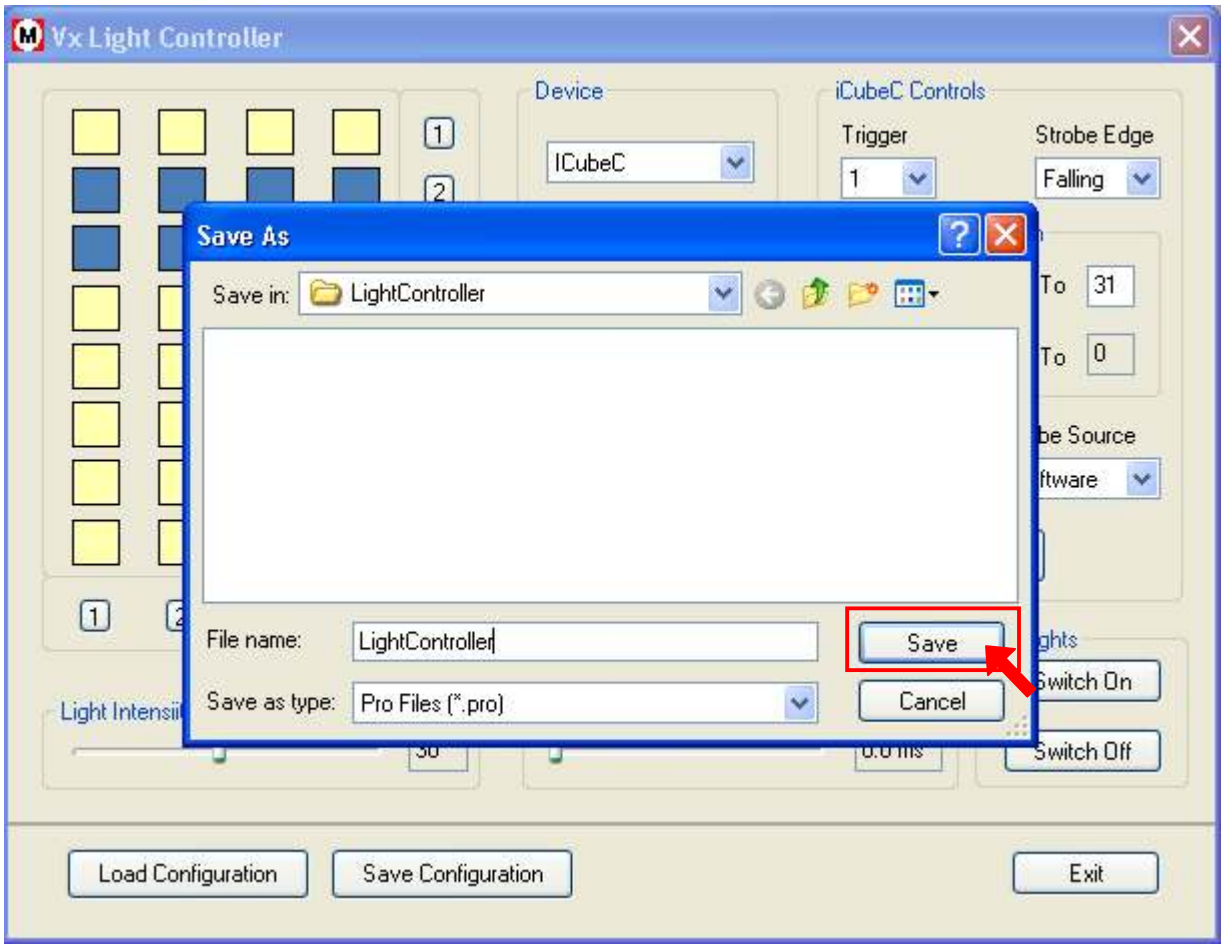


Fig 4.23: Select the location where the configuration data is required to be saved.

Note: After setting the light pattern for Bank 0, light pattern for Bank 1 can also be set by following the steps 1 to 4.

Step 5: Loading the Saved Configuration

The stored configuration can be loaded on to the ICubeC by clicking the *"Load Configuration"* button. Figures 4.24 and 4.25 illustrate the loading of the stored configuration on to the ICubeC

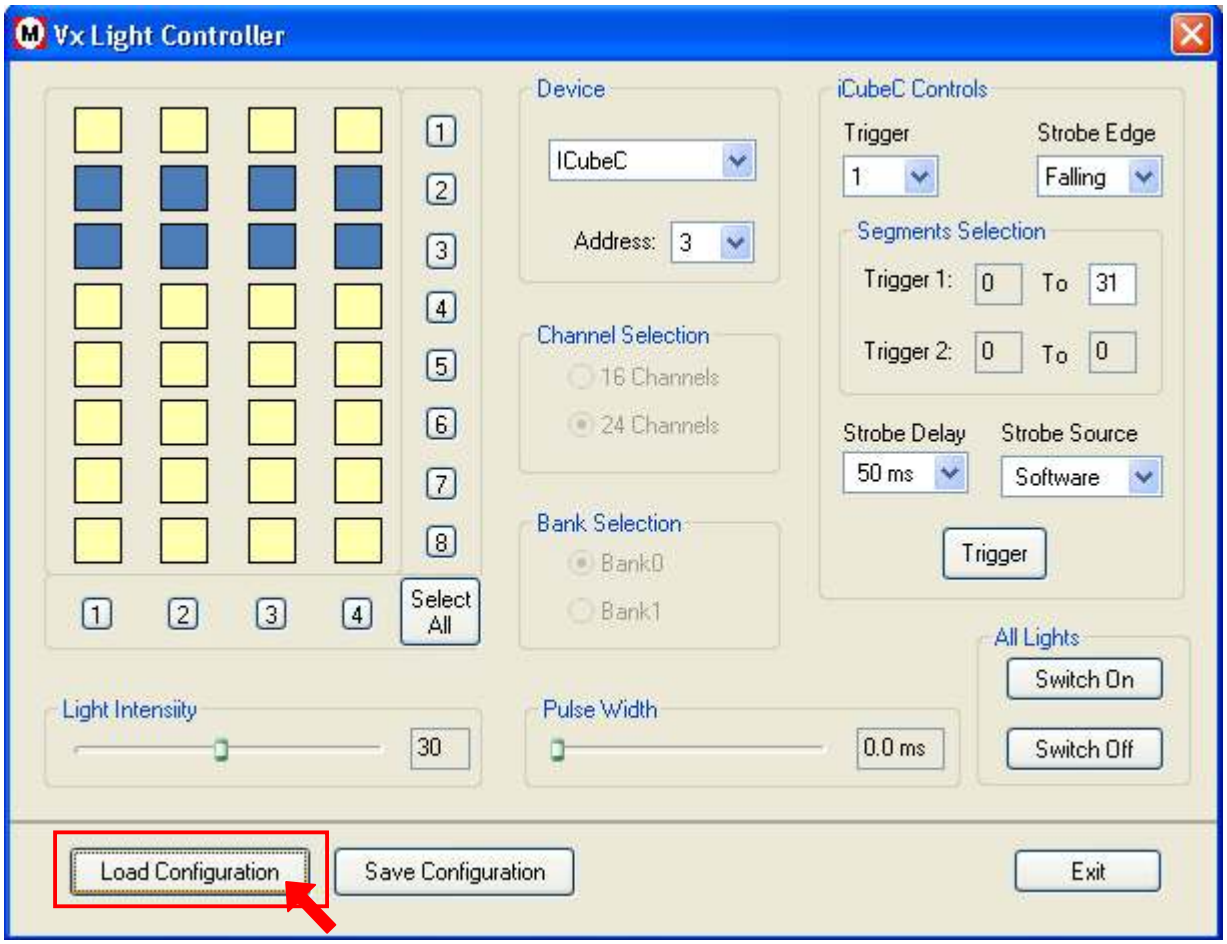


Fig 4.24: Click the "Load Configuration" button.

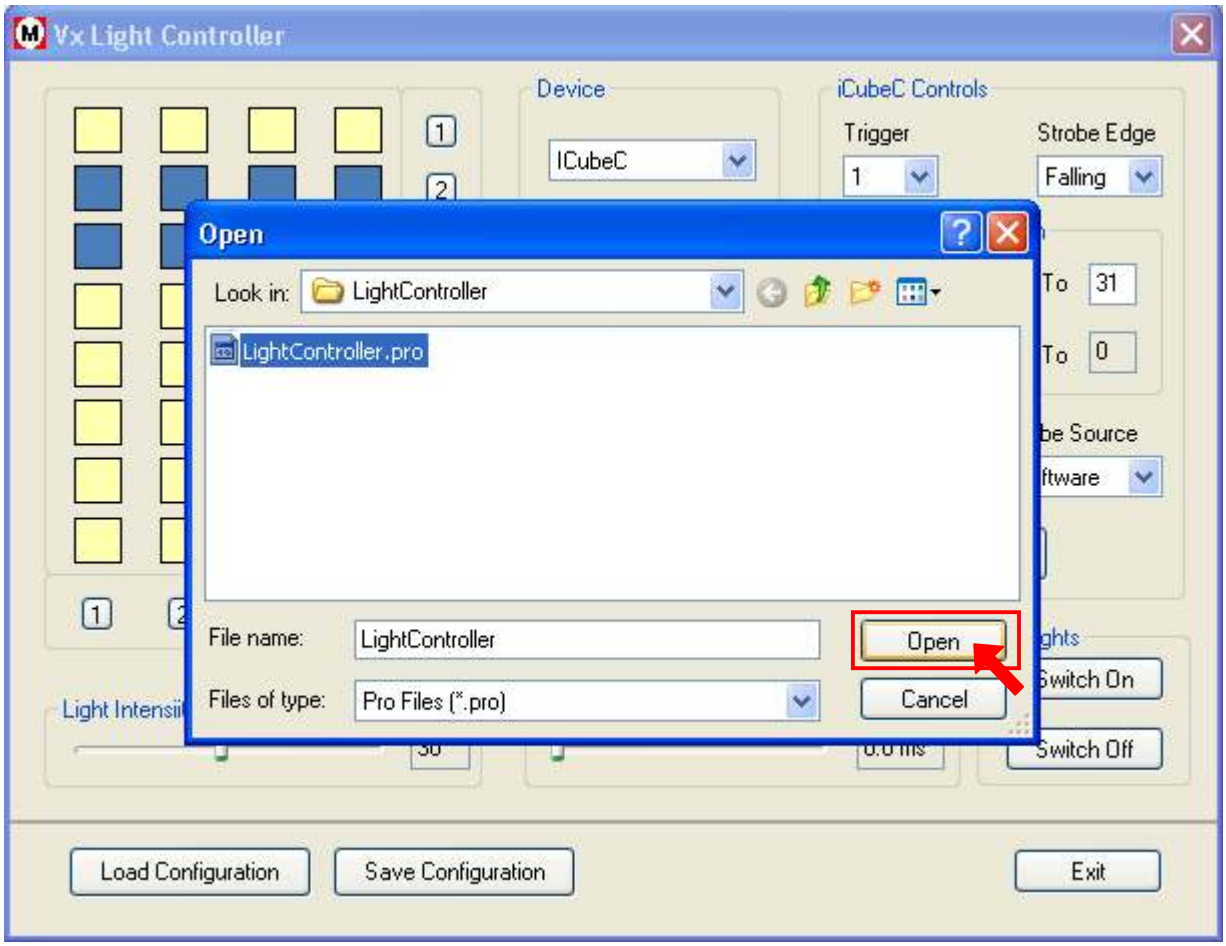


Fig 4.25: Select the location, which contains the saved configuration.

Then click the “Open” Button, to load the configuration on to the ICubeC.

Note: The above-mentioned steps should be followed for different light configurations as per the user requirement.